

Cornell University

ANNOUNCEMENTS

New York State College of Agriculture



1966-67

A Contract College of the State University
Cornell University, Ithaca, New York

CORNELL UNIVERSITY ANNOUNCEMENTS

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Cornell University

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of Agriculture

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Academic Calendar

1966-67

Freshman Orientation	S, Sept. 17
Registration, new students	M, Sept. 19
Registration, old students	T, Sept. 20
Instruction begins, 1 p.m.	W, Sept. 21
Midterm grades due	W, Nov. 9
Thanksgiving recess:	
Instruction suspended, 12:50 p.m.	W, Nov. 23
Instruction resumed, 8 a.m.	M, Nov. 28
Christmas recess:	
Instruction suspended, 10 p.m.	W, Dec. 21
Instruction resumed, 8 a.m.	Th, Jan. 5
First-term instruction ends	S, Jan. 21
Registration, old students	M, Jan. 23
Examinations begin	T, Jan. 24
Examinations end	W, Feb. 1
Midyear recess	Th, Feb. 2
Midyear recess	F, Feb. 3
Registration, new students	S, Feb. 4
Second-term instruction begins, 8 a.m.	M, Feb. 6
Midterm grades due	S, Mar. 25
Spring recess:	
Instruction suspended, 12:50 p.m.	S, Mar. 25
Instruction resumed, 8 a.m.	M, Apr. 3
Second-term instruction ends, 12:50 p.m.	S, May 27
Final examinations begin	M, May 29
Final examinations end	T, June 6
Commencement Day	M, June 12

The 1967-68 Academic Calendar was incomplete at publication date, but it will include the following (clock hours unavailable): First-term instruction begins Monday, Sept. 11, 1967; it is suspended for the Thanksgiving Recess Wednesday, Nov. 22, and for the Christmas Recess Saturday, Dec. 16. Study Period begins Wednesday, Jan. 3, 1968. Examinations begin Monday, Jan. 8. Second-term instruction begins Monday, Jan. 29, and ends Saturday, May 11. Study period begins Monday, May 13. Examinations begin Monday, May 20.

CORNELL UNIVERSITY ANNOUNCEMENTS

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As of January 1, 1966

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 Earl Howard Brown, Ph.D., Business Management.
 William Louis Brown, Jr., Ph.D., Entomology.
 Robert Lee Bruce, Ph.D., Extension Education.
 Harlan Brown Brumsted, Ph.D., Conservation.
 Paul Andrews Buck, Ph.D., Food Science.³
 David Lincoln Call, Ph.D., Food Economics.
 Robert Charles Cetas, Ph.D., Plant Pathology.
 Winton Guy Covey, Jr., M.S., Meteorology.
 Loy Van Crowder, Ph.D., Plant Breeding.
 Gordon Joseph Cummings, Ph.D., Rural Sociology.
 Otis Freeman Curtis, Jr., Ph.D., Pomology, Geneva.
 Alexander Cochran Davis, Ph.D., Entomology, Geneva.
 Hollis Rexford Davis, M.S., Agricultural Engineering.
 Robert Howard Deibel, Ph.D., Bacteriology.
 Bernard Emile Dethier, Ph.D., Agricultural Climatology.
 Robert Shaft Dickey, Ph.D., Plant Pathology.
 Desmond Daniel Dolan, Ph.D., Seed Investigations, Geneva.
 William Emerson Drake, Ph.D., Agricultural Education.
 William John Dress, Ph.D., Botany in the L. H. Bailly Hortorium.
 Edward Oscar Eaton, Ph.D., Agricultural Engineering.
 Alfred Ward Eipper, Ph.D., Fishery Biology.
 Thomas Eisner, Ph.D., Biology.
 Bertram Leighton Ellenbogen, Ph.D., Rural Sociology.
 John Murray Elliot, Ph.D., Animal Husbandry.

Robert Hugh Ennis, Ph.D., Secondary Education.
 Milton Harlan Erdmann, Ph.D., Field Crops.
 Elmer Ellis Ewing, Ph.D., Vegetable Crops.
 Lloyd Dodge Fernald, Jr., Ph.D., Guidance and Personnel Administration.
 Reeshon Feuer, Ph.D., Agronomy.
 Charles Clayton Fischer, M.S., Floriculture.
 Richard Bernard Fischer, Ph.D., Nature and Science Education.
 Thomas Gobaton Flores, Ph.D., Extension Teaching and Information.
 Olan Dean Forker, Ph.D., Marketing.
 Chester Gene Forshey, Ph.D., Pomology, Geneva.
 Raymond Thomas Fox, Ph.D., Floriculture.
 George Free, M.S., Soil Technology.
 Donald K. Freebairn, Ph.D., Agricultural Economics.
 Chester Higby Freeman, M.S.A., Extension Teaching.
 Ronald Bay Furry, Ph.D., Agricultural Engineering.
 Harrison Adam Geiselmann, Ph.D., Secondary Education.
 Dana Clement Goodrich, Jr., Ph.D., Marketing.
 Walter Leo Griffeth, Ph.D., Agronomy.
 Richard William Guest, M.S., Agricultural Engineering.
 Lawrence Stanley Hamilton, Ph.D., Forestry.
 John Harp, Ph.D., Rural Sociology.
 Martin Bernard Harrison, Ph.D., Plant Pathology.
 Dennis August Hartman, Ph.D., Animal Husbandry.
 Milton Ellsworth Hislop, M.S., Extension Service and Associate State Leader of
 County Agricultural Agents.
 Joseph Frederick Hodgson, Ph.D., Soil Science.
 Douglas Emerson Hogue, Ph.D., Animal Husbandry.
 John William Ingram, Jr., Ph.D., Botany.
 Orvis Franklin Johndrew, Jr., M.S., Poultry Husbandry.
 Warren Thurston Johnson, Ph.D., Entomology and Plant Pathology.
 Edward David Jones, Ph.D., Plant Pathology.
 Lloyd Hugh P. Jones, Ph.D., Soil Science.
 Louis William Kaiser, B.F.A. in Radio, Extension Teaching and Information.
 William Tinsley Keeton, Ph.D., Biology.
 John Merriam Kingsbury, Ph.D., Botany.
 John Paul Kramer, Ph.D., Entomology.
 Ralph Edward Krenzin, Ph.D., Field Crops.
 Robert Lawrence LaBelle, B. Chem. E., Chemistry, Geneva.
 Robert Consay Lamb, Ph.D., Pomology, Geneva.
 Robert John Lambert, M.S., Frechand Drawing.
 Robert Wing Langhans, Ph.D., Floriculture.
 James Edward Lawrence, M.S., Extension Teaching and Information.
 John William Layer, M.S., Agricultural Engineering.
 James Nathaniel Layne, Ph.D., Zoology.
 Fred George Lechner, D.Ed., Agricultural Engineering.
 Frank Andrew Lee, Ph.D., Chemistry, Geneva.
 Robert Edwin Lee, Ph.D., Floriculture.
 Arthur Stuart Lieberman, M.S., Floriculture.
 Siegfried Eric Lienk, Ph.D., Entomology, Geneva.
 Donald James Lisk, Ph.D., Pesticidal Chemistry.
 James William Longest, Ph.D., Extension Service and Rural Sociology.
 Ruby M. Loper, B.S., Agricultural Engineering.
 Robert Theodore Lorenzen, M.S., Agricultural Engineering.
 David Corbin Ludington, M.S., Agricultural Engineering.
 Russell Earl MacDonald, Ph.D., Bacteriology.
 Guilford LeRoy Mack, Ph.D., Chemistry, Geneva.

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Russell Dickinson Martin, M.S., Extension Teaching.
Gerald Alvin Marx, Ph.D., Vegetable Crops, Geneva.
Louis Melville Massey, Jr., Ph.D., Biochemistry, Geneva.
Howard W. Matott, M.S., Extension Service and Assistant State Leader of
County Agricultural Agents.
Leonard Robert Mattick, Ph.D., Food Science, Geneva.
William George Merrill, Ph.D., Animal Husbandry.
Roy Leonard Millar, Ph.D., Plant Pathology.
Jason Millman, Ph.D., Educational Psychology and Measurement.³
Robert Rising Morrow, Jr., Ph.D., Forestry.
Roger Alfred Morse, Ph.D., Apiculture.
Arthur Leslie Neal, Ph.D., Biochemistry.
Malden Charles Nesheim, Ph.D., Animal Nutrition and Poultry Husbandry.
Gene Herman Oberly, Ph.D., Pomology.
Charles Evans Ostrander, M.S., Poultry Husbandry.
Gunnar Arnljot Oygard, Ph.D., Agricultural Economics.
LaVerne LeRoy Pechuman, Ph.D., Entomology and Curator of Insects.
Nathan Hiram Peck, Ph.D., Vegetable Crops, Geneva.
Arthur Morton Phillips, Jr., Ph.D., Fishery Biology.
Ellis Andine Pierce, Ph.D., Animal Husbandry.
Wilson Gideon Pond, Ph.D., Animal Husbandry.
Lloyd Earl Powell, Jr., Ph.D., Pomology.
Edgar Merrow Raffensperger, Ph.D., Economic Entomology.
Gerald Edwin Rehkugler, M.S., Agricultural Engineering.
Charles Clyde Russell, M.J., Extension Teaching and Information.
Roger France Sandsted, Ph.D., Vegetable Crops.
Robert John Scannell, M.L.A., Ornamental Horticulture.
George Albert Schaefer, Ph.D., Entomology, Geneva.
Edward Arthur Schano, M.S., Poultry Husbandry.
Ernest Frederick Schaffer, M.S.A., Ornamental Horticulture.
Glen Henry Schmidt, Ph.D., Animal Husbandry.
Bernice Margaret Scott, M.A., Rural Sociology.
Thomas Walter Scott, Ph.D., Soil Science.¹
Robert Ramsey Seany, Ph.D., Plant Breeding and Agronomy.
Shayle Robert Searle, Ph.D., Biological Statistics.
Maurie Semel, Ph.D., Entomology.
Robert Sands Shallenberger, Ph.D., Biochemistry, Geneva.
Edgar Moore Shantz, Ph.D., Plant Physiology.
Raymond Sheldrake, Jr., Ph.D., Vegetable Crops.
Don Frederick Splittstoesser, Ph.D., Bacteriology, Geneva.
James Ray Stouffer, Ph.D., Animal Husbandry.
Phyllis Eloise Stout, M.S., Extension Service, and Associate State 4-H Club
Leader.
Michiyasu Sugii, Ph.D., Plant Physiology.
John C. Swan, M.S., Extension Service, and State Leader of County Agricultural Agents.
Harold Barber Sweet, B.S., Extension Service, and Associate State 4-H Club
Leader.
Glen Hanna Thacker, M.S., Poultry Husbandry.
Daniel Quale Thompson, Ph.D., Wildlife Management.
John Fanning Thompson, Ph.D., Botany.
Frederick Kwai Tuck Tom, Ph.D., Agricultural Education.
John Preston Tomkins, Ph.D., Pomology.
Hugh Farrant Travis, Ph.D., Animal Husbandry.
Harold Bradford Tukey, Jr., Ph.D., Ornamental Horticulture.

Charles Harrison Uhl, Ph.D., Botany.
 Robert Bruce Underwood, M.A., Extension Teaching and Information.
 Jerome Paul VanBuren, Ph.D., Biochemistry, Geneva.
 Ari van Tienhoven, Ph.D., Avian Physiology.
 Armand R. H. Van Wambeke, D.Agr.Sc., Soil Science.
 Gordon Forrest Vars, Ed.D., Secondary Education and Director, Junior High School Project.
 Donald Howard Wallace, Ph.D., Vegetable Crops and Plant Breeding.
 Wallace Edwin Washbon, M.S., Extension Service, and Associate State Leader of County Agricultural Agents.
 Roger Darlington Way, Ph.D., Pomology, Geneva.
 John August Weidhaas, Jr., Ph.D., Entomology.
 Robert Elzworth Wilkinson, Ph.D., Plant Pathology.
 Charles Edward Williamson, Ph.D., Plant Pathology.
 Hugh Monroe Wilson, Soil Conservation.
 Carl Seymour Winkelblech, M.S., Agricultural Engineering.
 Madison Johnston Wright, Ph.D., Agronomy.
 Frank Wilbur Young, Ph.D., Rural Sociology.
 Roger Grierson Young, Ph.D., Insect Biochemistry.
 Stanley Arnold Zahler, Ph.D., Microbiology.³
 Paul Joseph Zwerman, Ph.D., Soil Conservation.

Assistant Professors

David Jepson Allee, Ph.D., Land Economics.
 Richard Arthur Barr, Ph.D., Plant Physiology.
 David Martin Bates, Ph.D., Botany in the L. H. Bailey Hortorium.
 John Butts Bourke, Ph.D., Chemistry, Geneva.
 Malcolm Cornelius Bourne, Ph.D., Food Science, Geneva.
 Wallace Dale Brown, M.S., Extension Service and Assistant State Leader of County Agricultural Agents.
 Joseph Mark Calvo, Ph.D., Biochemistry.
 Ronald Frederick G. Campbell, Ph.D., Extension Teaching and Information.
 Robert Lloyd Carroll, Ph.D., Rural Sociology.
 George Louis Casler, M.S., Farm Management.
 Keewhan Choi, Ph.D., Biological Statistics.
 George Joseph Conneman, Jr., M.S., Agricultural Economics.
 Carl Edward Coppock, Ph.D., Animal Husbandry.
 Leroy Lawrence Creasy, Ph.D., Pomology.
 Frank George Dennis, Jr., Ph.D., Pomology, Geneva.
 Alexander Dickson, M.S., Forestry.
 Michael Hugh Dickson, Ph.D., Vegetable Crops, Geneva.
 Paul Robert Eberts, Ph.D., Rural Sociology.
 Mrs. Joan Roos Enger, Ed.D., Education Administration.
 Mrs. Ann M. Elliot, B.F.A., Frechand Drawing.
 Daniel Frederick Farkas, Ph.D., Food Processing Extension, Geneva.
 Leonard William Feddema, Ph.D., Personnel Administration.
 Mrs. Lois White Fish, M.S., Extension Service, and Assistant State 4-H Club Leader.
 John Latimer Forney, Ph.D., Fishery Biology.
 Carl Frank Gortzig, M.S., Floriculture.
 Lonnie Ross Hackler, Ph.D., Biochemistry, Geneva.
 Donald James Hall, Ph.D., Limnology.
 Kenneth Dyer Hickey, Ph.D., Plant Pathology.

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Richard David Holsten, A.B., Physiology.
Elgin Boyd Hundtoft, M.S., Agricultural Engineering.
Wilmot Wheeler Irish, M.S., Agricultural Engineering.
Donald Leo Jewett, M.S., Extension Service.
Elizabeth Beach Keller, Ph.D., Biochemistry.
Anwar Ahmad Khan, Ph.D., Seed Physiology, Geneva.
Abraham Der Krikorian, B.S., Physiology.
Joe Kubota, Ph.D., Soil Science.
Roland Melville Leach, Jr., Ph.D., Animal Nutrition.
Richard Allison Ledford, Ph.D., Dairy Science.
Richard Mullington Lewis, Ph.D., Ornamental Horticulture, and Curator of
Cornell Plantations.
Dean LeRoy Linscott, Ph.D., Field Crops.
Paul Charles Lippold, Ph.D., Entomology, Geneva.
James Wendell Lorbeer, Ph.D., Plant Pathology.
Robert Francis Lucey, Ph.D., Field Crops.
Nicolaas G. M. Luykx II, Ph.D., Public Administration.
Charlie Anton Martinson, Ph.D., Plant Pathology.
George Wilson McConkie, Ph.D., Psychology and Educational Psychology.
Richard Jerome McNeil, Ph.D., Conservation.
Alexander Millar Meek, Ph.D., Animal Husbandry.
Murray Hudson Milford, Ph.D., Soil Science.
Warren Glenn Monson, Ph.D., Field Crops.
Robert Glenn Mower, Ph.D., Ornamental Horticulture.
Joseph Edward Nowrey, Ph.D., Food Technology.
Donald Kenneth Ourecky, Ph.D., Pomology, Geneva.
Jimmy Lee Ozbun, Ph.D., Vegetable Crops.
James Thomas Pennell, Ph.D., Entomology.
Thomas Theobald Poleman, Jr., Ph.D., Agricultural Economics.
Donald Ray Price, M.S., Agricultural Engineering.
Henry Abraham Regier, Ph.D., Fishery Biology.
Richard Warren Robinson, Ph.D., Vegetable Crops, Geneva.
Wendell Lee Roelofs, Ph.D., Chemistry, Geneva.
Richard Bruce Root, Ph.D., Insect Ecology.
John Neil Rutger, Ph.D., Plant Breeding.
Samuel Waybright Sabin, Ph.D., Animal Husbandry.
George Demetrius Saravacos, Sc. D., Food Science, Geneva.
Otto E. Schultz, Ph.D., Plant Pathology.
Norman Roy Scott, Ph.D., Agricultural Engineering.
Stanton Shannon, Ph.D., Vegetable Crops, Geneva.
John Walter Sherbon, Ph.D., Dairy and Food Science.
John Cornelius Siemens, Ph.D., Agricultural Engineering.
Maurice Lucien Sill, Ph.D., Rural Sociology.
Wayne Alfred Sinclair, Ph.D., Plant Pathology.
Daniel Gene Sisler, Ph.D., Agricultural Geography.
John Richard Stamer, Ph.D., Bacteriology, Geneva.
John Bruce Stone, Ph.D., Animal Husbandry.
William Goodrich Tomek, Ph.D., Prices.
Leonard Daniel Topoleski, Ph.D., Vegetable Crops.
Henry Flansburg Tyrrell, Ph.D., Animal Science.
N. Scott Urquhart, Ph.D., Biological Statistics.
Lloyd Dale VanVleck, Ph.D., Animal Husbandry.
Walter Frederick Wilkens, Ph.D., Food Science, Geneva.
Mrs. Ying Yao Wang, Ph.D., Biological Statistics.

Senior Research Associates

Lyndon Belmont Carew, Jr., Ph.D., Poultry Husbandry.
Leland Spencer, Ph.D., Marketing.

Instructors

Harrison William Ambrose III, M.S., Biology.
Katherine Emily Barnes, B.S., Extension Teaching and Information.
Philip Walter Basson, Ph.D., Botany.
Leeds Mario Carluccio, M.S., Botany.
Natalie Gundrey Delvaille, B.S., Extension Teaching and Information.
Betsy Franz McGlashan, B.S., Biology.
Mrs. Margaret Estelle Nolan, B.S., Biochemistry.
James Skeoch Townsend, M.S., Agricultural Engineering.
Allan Witztum, B.S., Botany.

Cornell University

THE NEW YORK STATE COLLEGE OF AGRICULTURE

Cornell University, the land-grant institution for New York State, was chartered by the Legislature in 1865. By the terms of the Land-Grant Act of 1862, teaching in agriculture has been, from the beginning, a regular part of the University program. In 1904 the legislature of the State of New York established the College of Agriculture as a state institution under the title, "The New York State College of Agriculture at Cornell University," and made an appropriation for the erection of buildings for the College. In 1906 an administration act was passed by the legislature defining the purpose and activities of the College of Agriculture thus: "The object of said College of Agriculture shall be to improve the agricultural methods of the state; to develop the agricultural resources of the state in the production of crops of all kinds, in the rearing and breeding of livestock, in the manufacture of dairy and other products, in determining better methods of handling and marketing such products, and in other ways; and to increase intelligence and elevate the standards of living in the rural districts. For the attainment of these objects the College is authorized to give instruction in the sciences, arts, and practices relating thereto, in such courses and in such manner as shall best serve the interests of the state; to conduct extension work in disseminating agricultural knowledge throughout the state by means of experiments and demonstrations on farms and gardens, investigations of the economic and social status of agriculture, lectures, publication of bulletins and reports, and in such other ways as may be deemed advisable in the furtherance of the aforesaid objects; to make researches in the physical, chemical, biological, and other problems of agriculture, the application of such investigations to the agriculture of New York, and the publication of the results thereof."

With the creation of the State University of New York in 1948, the College of Agriculture, as one of the four contract colleges at Cornell

University, became an integral part of this new State University. "Created to provide a comprehensive and adequate program of higher education," the State University now includes more than thirty educational institutions. The College of Agriculture, functioning in this broad context, offers teaching and research facilities to serve the agricultural needs of the state.

THE COURSES AVAILABLE

The resident instruction in the College of Agriculture is planned for those who desire an education in agriculture and in the sciences most closely related to agriculture. It is organized, for the most part, in a course of four years, or eight terms, leading to the degree of Bachelor of Science. Those who want instruction in a special field may register for one or more terms as special students, provided they are qualified by education and experience to pursue the courses they want to take (see page 28).

For those who cannot plan to take four years of college work, special one-year curricula are organized to give specific training for definite vocational objectives. The two-year course will be discontinued with the class entering in September, 1966. Starting in September, 1967, a limited number of special students will be admitted to pursue a one-year curriculum as provisional candidates for the B.S. degree (see page 29).

Graduate work in the various fields of agriculture is under the jurisdiction of the Graduate School of Cornell University to which questions about admission should be addressed.

Aside from the above, there is regularly a six-week summer school designed especially for teachers, school principals, and superintendents.

There are also one-week and two-week courses with specific purposes.

The information contained in this Announcement applies specifically to the four-year course. Circulars describing the other courses referred to may be obtained on application to the Secretary of the College.

THE FOUR-YEAR COURSE

The four-year course provides an education in science with emphasis upon applications in agriculture. Graduates of the College are found in such a wide variety of occupations and situations, that only a broad and basic education can give many of them the foundation needed in adjusting to the changes and responsibilities that will come their way. While it is literally correct to think of "agriculture" as applying to crop and livestock production on farms, the four-year course is organized and functions in a much broader educational context.

The requirements for a degree, as outlined on page 29, are extremely flexible, with only a few specific courses demanded of all students. The major part of the program for any individual student is chosen from three large groups of courses. This opportunity for election may result

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in a broad, general program or one in which basic sciences or, to the other extreme, the more applied subjects, are emphasized almost exclusively.

Programs, arranged with the help of a faculty adviser, are available in the following fields:

Agricultural Business Management and Marketing	Forest Science
Agricultural Economics	Fruit Production
Agricultural Engineering	General Agriculture
Applied	Greenhouse Crop Production
Professional	International Agriculture
Agricultural Extension Service	Landscape Design
Agricultural Journalism	Limnology
Agricultural Missionary	Livestock Production
Animal Science	(Sheep, Swine, and Beef Cattle)
Biological Sciences	Meat and Meat Products
Combination Programs	Nursery Crop Production
Business and Public Administration	Plant Breeding
Nutrition	Plant Pathology
Professional Agricultural Engineering	Pomology
Veterinary	Poultry Production
Conservation	Poultry Science
Conservation Education	Preveterinary (2 years, students choose secondary objective)
Crops Science	Rural Sociology
Dairy Husbandry	Soils (including soil conservation)
Dairy and Food Science	Soil Science
Entomology	Statistics
Farm Finance	Teaching Science in High School
Farm Management	Teaching Vocational Agriculture in High School
Field Crops	Turfgrass Management
Fishery Science	Vegetable Crop Production and Marketing
Floriculture	Wildlife Science
Food Distribution	

EMPLOYMENT OPPORTUNITIES

The employment opportunities described in the paragraphs which follow are in fields of work in which graduates of the College currently are engaged. It would be possible to compile a long list of specific jobs held by graduates; instead, it has seemed more desirable to name only a few broad fields which include these specific jobs. Experience shows that students should not prepare too narrowly, because unforeseen circumstances may have an important bearing on the specific jobs which they accept initially. Preparation appropriate for a broad vocational field will qualify graduates for more than one job opening within that field or even for openings in more than one field.

FARMING. A first responsibility of the College is to the young men who plan to enter farming. A good living at satisfying work and an opportunity to contribute to community life await the graduates with the necessary farm experience and enough capital to operate a desirable

farm. These young men take a general course in agriculture, with emphasis on the type of farming they plan to follow. A general course likewise fills the needs of others who may enter related fields until they have enough capital to buy or rent a farm.

BUSINESS AND INDUSTRY. Leaders in business and industry, particularly in those businesses or industries that market farm products or serve the production needs of farmers, are continually seeking competent young persons with an agricultural college education.

The food industry is concerned with the movement of agricultural products, such as eggs, milk, meat, fruits, and vegetables, through processing plants and distribution channels to the consumer. To perform these varied services requires men and women with diverse kinds of preparation and personal characteristics. For instance, the milk industry provides opportunities in plant and laboratory work for graduates with educational and practical experience in the handling and processing of milk and milk products; in sales, business management, and regulatory jobs for graduates whose education has emphasized marketing and related courses in agricultural economics.

In the fruit and vegetable processing and marketing fields, there are jobs for fieldmen, buyers, raw-products inspectors, laboratory quality control workers, plant managers, wholesale distributors, and retail store managers. Most of these positions are with food processing companies and with retail food chains.

The business of supplying feed for New York dairy cattle and poultry is of major importance. It requires men who know New York agriculture and, more particularly, who know feeds and the feed requirements of the various types of livestock. The production and the delivery of fertilizers, machinery, pesticides, and all other supplies used on our farms, require the services of qualified men. They may need to be well-trained scientists, technicians, salesmen, promotional specialists, or plant operators. Some may serve eventually as managers or in other administrative capacities.

All businesses in agriculture require employees with a knowledge of financing, advertising, insurance, and other specialized services. Credit organizations, both private and governmental, advertising concerns, and insurance companies have employed graduates of the College. Farm-loan representatives have been employed by local banks, insurance companies, and the various branches of the Farm Credit Administration. Farm experience and the ability to work with people are valuable assets as qualifications for employment, along with a general education in agriculture, including agricultural economics.

The production and sale of flowers and ornamental shrubs in New York is an important and large business. Many students who specialize in floriculture and ornamental horticulture are sons and daughters of persons in the greenhouse or nursery business. Others who do not have that background but combine practical experience with their college education find satisfactory opportunities upon graduation.

The College does not have a school of journalism, but it offers several courses in agricultural journalism, visual aids, and television and radio writing and broadcasting. Job opportunities include editorial and staff

positions on newspapers, farm papers, and farm magazines. Agricultural college graduates occupy positions as farm program directors and farm news writers for radio and television services in the state colleges throughout the nation.

HIGH SCHOOL TEACHING. Two kinds of secondary school teachers are prepared at the College—teachers of agriculture and teachers of science.

Approximately 275 secondary schools in New York State have departments of agriculture, each of which requires the services of one or more teachers. The agricultural instruction in high school includes specialized course offerings in agricultural business, agricultural mechanics, conservation and forestry, farm operation and management, and ornamental horticulture. Newly graduated teachers are continually needed to serve new departments being organized in schools and to replace teachers who retire or change to other occupations. Young men who have a vital interest in youth who desire to study agriculture, and an understanding of the importance of agriculture in the total economy will find the teaching of agriculture a challenging and rewarding field of service. Moreover, the experience gained as a teacher provides an excellent background for related positions in the public schools as administrators or counselors; as teachers in post-high-school institutions offering instruction in agriculture; and in agricultural agencies and businesses, including farming.

The high birth rate of the 1940's and the early 1950's and the increasing number of boys and girls who complete high school have created a strong demand with improved salaries for high school teachers in all fields. Because of the need for scientists in industry as well as in education, the demand for science teachers is particularly acute. This demand is certain to become even greater as boys and girls in the lower grades move on into high school. The young man or young woman who has both an interest in and aptitude for science courses and mathematics, as well as a sincere interest in the welfare of young people, will find rewarding experiences in preparing for and later in serving as a teacher of high school science.

RESEARCH AND COLLEGE TEACHING. Research related to agriculture is concerned with adding to the fund of knowledge bearing on the production, processing, or distribution of farm products. It may be of an economic, social, physical, biological, or chemical nature, depending on the particular kind of problem being studied. The majority of those responsible for research have had advanced, specialized study in a graduate school. Graduates of the four-year course in the College who have superior records and a sound background in basic subject matter have the opportunity to pursue graduate study, often with the help of a graduate assistantship or fellowship to defray part of the costs. In recent years, about one-half of the graduates of the College of Agriculture have continued with graduate or professional study. Positions available upon completion of graduate study are both within and outside the agricultural field.

College teaching involves preparation of the same kind as is needed

for research. Whether one engages in research or in teaching depends on personal interests and abilities as well as on opportunities available at the time graduate study is completed. In many cases, graduates hold positions which combine teaching and research.

AGRICULTURAL EXTENSION. The term "agricultural extension" refers to the extending of agricultural knowledge in an out-of-school situation. Cooperative extension, as a part of the University, has agricultural extension agents and I-H extension agents in most counties of the state. College department staff members with extension responsibilities provide leadership for instigating adoption of new knowledge. Cooperative extension, agricultural missionary, and commercial extension opportunities are open to those who are competent in subject matter and in communication.

WILDLIFE CONSERVATION. Opportunities in the conservation and management of fish and wildlife are found principally in employment with either the state or federal government. Occasionally, there are openings with museums and private foundations. The preparation in college emphasizes the biological sciences. The work is likely to consist chiefly of survey and research, but in recent years many management and administrative positions have been established. As such, the work is exacting but of great interest to those scientists with a desire to develop and conserve our wildlife resources and to help the people to understand them.

SOCIAL SERVICES AND RURAL ORGANIZATIONS. Students may elect a social science concentration as applied to agriculture and rural life. Graduates with this kind of education find opportunities with farm organizations, as caseworkers in local public welfare departments, as camp directors and with youth organizations and community centers. Competent persons with specialized preparation in the rural social sciences at the graduate level are in increasing demand to fill community development positions in the United States and abroad; by agricultural business firms for research; by colleges for extension, research and teaching; and by government research and action agencies. The undergraduate concentration in the rural social sciences provides an excellent foundation for later professional study in preparation for the many opportunities with community planning councils and health and welfare councils; for the professional positions in agencies providing health and welfare services; and for the rural ministry.

FOREIGN SERVICE. In recent years, the international aspect of American agricultural activities, interests, and problems has received increased emphasis. In 1963, the New York State College of Agriculture established a program in International Agricultural Development as a part of Cornell University's contribution toward helping other countries in their efforts to improve agricultural production and standards of living. This added a fourth dimension to the three other divisions of the College of Agriculture—resident instruction, research, and extension.

One part of this new division is an undergraduate program in the vital and rewarding area of international agriculture. Graduates of this

program will find opportunities with International Voluntary Services, the Peace Corps, and similar organizations. After gaining overseas experience, they may qualify for foreign assignments with agencies of the United States Government, the Food and Agriculture Organization of the United Nations, or one of the foundations. Occasionally, requests are received for graduates to work for governments of foreign countries.

STATE AND FEDERAL CIVIL SERVICE. Several agricultural agencies, both state and federal, employ their personnel from registers established by the New York State Department of Civil Service or the United States Civil Service Commission. Positions with these organizations may be of a research, extension, regulatory, or administrative nature. To gain a place on Civil Service registers, seniors or graduates take the appropriate examinations which are announced from time to time.

PLACEMENT SERVICES

Placement services for graduating seniors and alumni are on a decentralized but coordinated basis. The University Placement Service is available to all students and alumni of the University and is of most value to those students of the College of Agriculture who are seeking positions in business or industrial fields.

The Educational Placement Bureau serves all students and alumni of the University who are qualified for and interested in teaching or related positions in elementary and secondary schools and in colleges. College of Agriculture graduates in the fields of science teaching and vocational agriculture teaching may be placed through this Bureau.

The Office of Resident Instruction of the College provides a service which combines vocational guidance and placement and is available to both students and alumni. Those interested in graduate study are referred to the appropriate departmental offices for further information and assistance. Placement in the county extension services is a function of the State Leaders' offices in Agricultural and 4-H Club extension.

Students and alumni also learn informally of employment opportunities through individual professors to whom requests may come because of their wide contacts with prospective employers throughout New York State.

DIRECTIONS REGARDING CORRESPONDENCE

For admission to the freshman class, to a special course, or to advanced standing from other colleges and universities, all communications should be addressed to the Director of Admissions of Cornell University, Edmund Ezra Day Hall.

For admission to graduate work in agriculture and candidacy for advanced degrees, communications should be addressed to the Dean of the Graduate School, Sage Graduate Center.

The *Announcement of General Information*, giving details concerning admission, expenses, scholarships, and related subjects, may be obtained by writing to Cornell University Announcements, Edmund Ezra

Day Hall. Announcements of the other colleges, schools, and departments of the University may also be obtained by writing that office.

THE APPLICATION FOR ADMISSION

Admission to the College involves more than presenting specified entrance units. Both the applicant and the College are concerned that a desirable choice of college study be made. For this reason, in choosing its students, the College considers not only the secondary school record, but also other available indications of success in the curriculum the applicant proposes to undertake. Therefore, the applicant should submit full information regarding his high school record, background, work experience, school and community activities, resources for financing a college education, and the purpose in seeking it. Such information provides a basis for full consideration of the application. Correspondence regarding these matters is welcome. Applicants are not required to come to the College for interviews, but those who wish to do so should write two or three weeks in advance for appointments. Conference hours are 10 a.m. until 12 noon and 2 until 4 p.m., during the week and 9 a.m. until 12 noon on Saturdays during the school year. The College office is closed on Saturdays during June, July, and August. Requests for Saturday appointments should be avoided if at all possible.

The practice requirement of the College is described on pages 29-32. Prospective students are urged to read these pages carefully. Those who have neither lived on farms nor had considerable practical farm experience, and who desire admission to a field of study for which farm experience is required, are advised to seek employment for at least one full summer on a well-managed family farm before entering college. This experience is not required for registration as a freshman, but for certain freshman courses it is educationally advantageous.

Candidates for admission to the four-year course must be at least sixteen years of age. The academic requirements may be satisfied by presentation of satisfactory scores in the Scholastic Aptitude Tests of the College Entrance Examination Board combined with acceptable secondary school grades which, for residents of New York State, should include scores on Regents examinations.

Admission to the four-year course is possible only in the fall term, except for students who enter with advanced standing. Applications should be filed during the fall term of the senior year in high school, at the Office of the Director of Admissions, Edmund Ezra Day Hall. Applications will be received until March 15 and after that date only if places in the class remain to be filled.

ENTRANCE REQUIREMENTS FOR THE FOUR-YEAR COURSE

The subjects that may be offered for admission to the College of Agriculture are named in the following list; the figures following each subject indicate the value in entrance units and show the maximum and the minimum amount of credit allowed in the subject. A unit represents five recitations a week for one year in a subject. In drawing and in-

26 ENTRANCE REQUIREMENTS

dustrial arts, 240 hours are required to earn one unit and 120 hours to earn one-half unit.

ENGLISH, 4 YEARS (required of all entering students) 4

FOREIGN LANGUAGES (modern and ancient) 1, 2, 3, 4
(If a foreign language is offered for entrance, it is desirable to present at least two years, although credit will be granted for a single year of study in not more than two languages.)

MATHEMATICS

Elementary Algebra	1	Plane Geometry	1
Intermediate Algebra	1	Solid Geometry	½
Advanced Algebra	½	Plane Trigonometry	½

Or (for schools following the recommendations of the College Board Commission on Mathematics):

College Preparatory Mathematics 1, 2, 3, or 4

SCIENCES

Biology	1	Earth Science	½-1
Botany	½-1	Physics	1
Chemistry	1	Zoology	½-1
General Science	1		

(If a unit in biology is offered, a half-unit in botany and a half-unit in zoology may not also be counted.)

SOCIAL STUDIES, including history (each course) ½-1

VOCATIONAL SUBJECTS

Agriculture	½-7	Home Economics	½-6
Bookkeeping	½-1	Industrial Arts	½-1
Drawing	½-1		

ELECTIVES—any high school subject or subjects not already used and acceptable to the University ½-2

For admission to the College of Agriculture, an applicant must have completed a secondary-school course and must offer both A and B as follows:

A. A *minimum* of sixteen units which must include four in English and three in Mathematics. Remaining units must be selected from the list above.

B. Scores of the Scholastic Aptitude Test of the College Entrance Examination Board. These must be on a test taken within one year prior to the date of anticipated matriculation. They are not required of applicants for adult special registration.

The Writing Sample administered by the College Board will be required for the admission of students who expect to matriculate in September, 1967, and thereafter. Candidates will probably wish to meet this requirement on the same College Board testing date selected for taking the Scholastic Aptitude Test. The Writing Sample is not required of applicants for adult special registration who do not intend to transfer to the degree course. Applicants are encouraged to complete College Board Achievement Tests in two of the following: English composition, mathematics, science.

It is strongly recommended that high school students carry enough courses to offer eighteen entrance units and that these include biology, chemistry, physics, and at least three and one-half units in mathematics.

A committee on admissions in the College of Agriculture reviews the

credentials of each applicant. In making its decision, the committee considers not only the nature of the subjects offered for admission and the quality of the work done in those subjects, and all available indications of ability for and interest in the work of the course to be undertaken in the College, but also the background, experience, character, and personality of the applicant.

The total number of women students at Cornell is fixed by the extent of the facilities provided by the University for the housing of women students. Present facilities are such that the number of women admitted each year must be restricted, with the result that competition for admission is especially severe for this group of applicants. First consideration is given to women who are residents of the State of New York since it is from public funds of the state that the College receives a large part of its financial support. A woman applying from outside of the state should therefore present an exceptionally strong record.

Students who wish to major in one of the sciences or to become research workers should offer adequate training in foreign languages.

Advanced Placement for Entering Freshmen

Prospective entering freshmen who have taken college-level courses in secondary school have the opportunity to qualify for advanced placement (and often for advanced standing credit) in these areas of study: biological sciences, chemistry, English, history, Latin, literature, mathematics, modern foreign languages, music, and physics.

In general those who wish to be considered for advanced placement or credit should plan to take the appropriate advanced placement examination(s) of the College Entrance Examination Board in May. Some of the departments listed above offer their own examinations at entrance, however, as an alternative or supplementary method of seeking advanced placement or credit.

Health Requirements on Entrance

Each entering student, graduate or undergraduate, is expected to assume personal responsibility for the health requirements adopted by the Board of Trustees of Cornell University. Prospective students should consult the *Announcement of General Information* * or the *Announcement of the Graduate School*. * Permission to register for a new semester will not be granted unless all health requirements pertaining to the previous semester have been fulfilled.

Admission With Advanced Standing

A student admitted to the College of Agriculture from another college in Cornell University, or from any other institution of collegiate rank.

* Since publication of the Announcements named above, the X-ray requirement has been revised to read as follows: "Every student is required to have a chest X-ray. Opportunity is given to satisfy this requirement during the student's first week on campus. The cost of the X-ray examination is included in the General Fee. When a student who has been away from the University for more than a year wishes to re-enter, he must, at his own expense, once more fulfill the chest X-ray requirement."

is regarded as having completed the number of terms and hours to which his records entitle him, and receives all the privileges of students who have completed the same number of terms and hours by residence in the College. He must furnish a transcript and a certificate of honorable dismissal from the institution from which he transfers. No more than fifteen semester hours of credit are allowed for one semester of work at another institution. To obtain the degree of Bachelor of Science, however, a student must have completed the prescribed subjects in the four-year course and the requisite number of elective hours in agricultural subjects. He must also have been in residence in the College of Agriculture for his past two terms and have completed not less than fifteen hours a term, of which two-thirds at least must be in subjects taught by the staff of the College of Agriculture. Because advanced-standing credit may reduce the number of summers available for farm or other work after admission, these applicants may be held to satisfy a part or all of the practice requirement at entrance, depending upon the number of terms of residence for which they are held.

Credit toward a degree for preparatory school work, beyond that used in satisfying entrance requirements, may be obtained through a satisfactory grade received in an Advanced Placement Test of the College Entrance Examination Board, in each subject.

College Proficiency Examination Program

Anyone wishing to obtain college credit through the College Proficiency Examination Program of the State Education Department should, prior to the taking of Examinations, consult the Director of Resident Instruction, Roberts Hall, as to conditions under which credit may be granted. Each application for credit assignment is considered on its own merits of purpose and preparation. The field in which credit is sought must be appropriate to the graduation requirements of the College, and the intent of the applicant must be clearly to use such credit toward meeting these requirements.

Requirements for Admission of Special Students

Opportunity is provided for the admission of students whose needs may not be well met by the organized curricula of the College. Applicants for admission to such special standing must present entrance credentials as other students do, and in addition they must present a detailed statement of the program they desire to follow. They must show that they have had recent farm experience or other experience qualifying them for the special work they plan to do, and, unless they meet the regular entrance requirements they must be twenty-one years of age.

Special students are assigned to faculty advisers who help them arrange a course of study which will contribute directly to their vocational objective and not necessarily to the requirements of the degree course. They may not elect more than one-third of their hours in any semester outside of the College of Agriculture. Transfer to the degree

course is sometimes possible for those whose record is considerably better than average and who otherwise give evidence of ability to carry advanced work.

Students having a first degree and desiring further undergraduate work may be admitted as special students. The work of such students is ordinarily limited to courses in the College of Agriculture; for work taken outside, tuition is charged at the rate prevailing in the college where the work is done.

Starting in September, 1967, a limited number of special students will be admitted to pursue a one-year curriculum as provisional candidates for the B.S. degree. These students will be expected to present the usual entrance requirements of sixteen acceptable entrance units, including four years of high school English, the Scholastic Aptitude Test and the Writing Sample. Ordinarily, three units of mathematics will also be expected. In addition, each student will be expected to have approximately a year of work experience appropriate to his objective.

REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE

The requirements for the degree of Bachelor of Science are residence for eight terms, except for those who make an average of C (2.0 quality points) or above, and, in addition to the prescribed work in physical education (outlined on page 33), the completion of 120 hours of required and elective work, as outlined on pages 21 and 22.

Freshmen are required to attend, during their first term, a course designed to orient students in the life of the University and specifically to acquaint them with the scope and purpose of the courses of instruction in the College. The course meets once a week and carries one hour of credit.

A student whose first enrollment in the College was in the fall of 1964 or thereafter must pass a written English Proficiency Examination. The Writing Sample of the College Entrance Examination Board required of accepted applicants (see page 26) satisfies this requirement if judged acceptable. If the Writing Sample is not acceptable, the student must subsequently pass a written English Proficiency Examination administered by a faculty committee in order to qualify for the degree.

To be eligible for the degree, the student must maintain an average grade of at least C— (1.7 quality points) for the entire course and must have an average of C— (1.7 quality points) or above in the last term. The "last term" is that semester or summer session at the end of which the student is to be recommended by the faculty for a degree.

The Practice Requirement

The faculty of the College of Agriculture has established a practice requirement that applies to both men and women students. The basic requirement is a minimum 13 units of practice credit from acceptable

experience on a farm, with 8 units of this credit required for registration in the sophomore year, and the entire 13 units for registration in the senior year. Credit for farm work experiences before matriculation is evaluated at the time of entrance. Factors considered in establishing the credits are (1) desirability of the farm from the standpoint of obtaining good experience; (2) the student's report on his farm experience; (3) reports from the farmer on the student's work; and (4) the results of a practical farm experience test. Farm experience credits after matriculation may be earned at the rate of approximately one credit per week of work, if the performance by the student in an acceptable work situation is good.

Exception to this requirement may be made, depending upon the objective and field of specialization of the student. Students qualify for these exceptions only after they have been so designated and reported by the adviser, for the specialty concerned, to the Offices of Student Practice and the Director of Resident Instruction.

Students in the following specializations may meet the requirement of 13 units of practice credit through farm experience or acceptable experience in their respective professional fields, or by a combination of the two:

Agricultural business management and marketing	Livestock production
Agricultural economics	Meat and meat products
Agricultural Extension Service (4-H Agent)	Plant breeding
Agricultural engineering	Plant pathology
Animal science	Pomology
Dairy husbandry	Poultry production
Farm Management and Farm Finance	Poultry science
Field crops	Rural sociology
International agriculture	Soil conservation
	Soils
	Vegetable crop production and marketing

In the following specializations, students may satisfy the practice requirement with 13 units of credit gained from appropriate experience of a professional nature:

Agricultural journalism	Food distribution
Biological sciences	Forest science
Conservation	Soil science
Conservation education	Statistics
Crops science	Teaching science in high school
Dairy and food science	Teaching vocational agriculture in high school
Entomology and limnology	Wildlife science
Fishery science	

In the following specializations, students are held for 25 units of credit from farm experience or acceptable professional experience:

Agricultural extension service (county agricultural agent)	Landscape design
Floriculture	Nursery crop production
Greenhouse crop production	Turfgrass management

It is not expected that all students will elect a definite field of specialization early in their college course. A rather high proportion of

the graduates have maintained general and broad interests and have elected general rather than specialized programs of instruction. On the other hand, many students have well-defined professional interests and will follow specialized programs as undergraduates. Some of these may wish to meet the practice requirement through work experience in their respective fields. To do this these students must declare their field of professional interest by March 1 of their freshman year. Course schedules are then made out for the succeeding fall semester. The subjects selected have a bearing on acceptance into the desired specialization which, in turn, determines the practice requirement for which the student will be held. Unless he has been accepted and so reported, in a specialization that permits or requires practice other than the basic requirements of 13 units of credit from farm experience, he will be held to obtain 8 of these units before enrollment in the sophomore year.

In some fields of specialization, the type of practice required may vary with the qualifications or interests of the individual student. In certain instances, practice of a specific type is expected early in the college career, while in others experience gained prior to the junior year will not be accepted. Because of these and other differences, it is desirable for students to discuss with their advisers, as soon as possible, the question of specialization and the practice that will be required. The responsibility for doing this rests with the student. It may be helpful to talk with advisers in several fields and with other available counselors so that decisions will be based on the best information obtainable.

When a student has been accepted by an adviser for a special field of study, this will be reported by the adviser to the Offices of Student Practice and the Director of Resident Instruction. That report will constitute the official record of the field of specialization and the amount and type of practice that have been agreed upon. Until such a report has been filed in these offices, the student will be held for the basic practice requirement as outlined in the second paragraph of this section.

It is recognized that the interests and objectives of students are subject to change. When this occurs, a student may change his adviser, and another form will be submitted to report the new specialization and corresponding practice requirement. If a change comes too late in the college course, it may delay the time for graduation. In each case the student is obliged to satisfy the practice requirement of the specialization that has been reported for him at the beginning of his senior year.

Practice requirements do not apply to students in the one-year courses or to those admitted as adult special students, because they must have met certain experience standards to qualify for admission. Should such students transfer later to the degree course, they must meet the appropriate practice requirement.

Members of the faculty will make suggestions and be of whatever assistance they can in connection with locating employment suitable to meet the practice requirement. However, the College assumes no responsibility for assuring the student that such employment will be found and no responsibility for acceptability to the student of particular working or living conditions. Both of these considerations are the ultimate responsibility of the individual student.

Prospective students and students who desire information about any aspect of the practice requirement or wish assistance in finding employment, should write or consult Professor S. R. Shapley, Student Practice Office, Roberts Hall, Ithaca, New York. The department concerned sometimes assists in finding employment for the specialized practice.

The Courses Leading to the Degree of Bachelor of Science

Following is an outline of the course requirements for graduation. Required courses given in the College of Arts and Sciences are described in the Announcement of that college.

Freshman Orientation Course	1 hr.
Physical sciences, biological sciences, social sciences, and humanities	45
Group A. Physical sciences. A minimum of 12 hours in at least 2 subject areas, including 6 hours of chemistry or physics. Subject areas: Astronomy 201, 202; chemistry; geology; mathematics; Meteorology 201, 202; physics.	
Group B. Biological sciences. A minimum of 12 hours in at least two subject areas including 6 hours of biology or botany or zoology. Subject areas: Introductory Biology or Introductory Botany and Zoology; Biological Sciences: * (animal physiology and anatomy) 210, 311, Veterinary Medicine 310; (biochemistry) 231, 431; (botany) 240, 341, 343, 344, 345, 347; (ecology, evolution and systematics) 270, 361, 362, 371; (genetics and development) 280, 281. Animal Science 220; (microbiology) 290, 290a, 290b; Entomology 210, 212, 351; Organic Chemistry; Plant Pathology 301, 309, 401.	
Group C. Social sciences and humanities. A minimum of 15 hours in at least 2 subject areas, including 6 hours of English. Subjects: American studies; economics; English; government; history; comparative literature; modern foreign language; philosophy; psychology or Rural Education 110; Rural Sociology 100 or anthropology or sociology; Industrial and Labor Relations 408, 409.	
Elective in the College of Agriculture (including any courses listed in this Announcement on pages 42 to 144 with exceptions specifically noted)	54
Electives (either in Agriculture or in any other college in the University)	20
Total	120

* Each section in parentheses is a separate subject area.

Orientation is not required of students entering with one term or more of advanced standing; in such cases, one hour is added to the requirement in electives in the College of Agriculture.

OFFICER EDUCATION. As a land-grant institution chartered under the Morrill Act of 1862, Cornell has offered instruction in military science for more than 90 years. This instruction is provided through the ROTC programs of the three military departments, Military Science, Naval Science, and Aerospace Studies.

These programs offer a male student the opportunity to earn a commission while he is completing his education, thus enabling him to fulfill his military commitment as an officer rather than through the draft. To obtain a commission in one of the armed services, a student must complete a four-year course of study in an ROTC program and must meet certain physical and mental requirements. Upon graduation he receives a commission and serves a required tour of active military service.

Participation in ROTC is voluntary. Interested students should enroll in the fall of the freshman year. For further details, see the *Announcement of Officer Education*.

Credit in the first four terms of ROTC does not count toward the 120 hours required for graduation in the College of Agriculture.

PHYSICAL EDUCATION. All undergraduates must complete four terms of work in physical education. Ordinarily, this requirement must be completed in the first two years of residence; postponement is to be allowed only by consent of the University Faculty Committee on Requirements for Graduation. Exemption from this requirement may be made by the Committee when it is recommended by the University Health Services, or because of unusual conditions of age, residence, or outside responsibilities. Students who have been discharged from the armed services may be exempted.

For students entering with advanced standing, the number of terms of physical education required is to be reduced by the number of terms which the student has satisfactorily completed (whether or not physical education was included in his program) in a college of recognized standing.

Material describing the courses offered in physical education will be made available to entering students by the Department of Physical Education.

Bachelor of Science With Distinction

The degree of Bachelor of Science with distinction will be conferred upon those students who, in addition to having completed all of the requirements for the Bachelor of Science degree, shall have done all of their undergraduate work at Cornell University and have cumulative averages of B+ (3.3 quality points) or above; and upon those transfer students who have been in residence for at least two years and have cumulative averages of A- (3.7 quality points) or above.

Dean's List

Excellence in scholarship is recognized twice a year by publishing as a Dean's List the names of those students who have completed at least 12 hours of course work, who are in good standing, and whose semester averages in academic courses are B+ (3.3 quality points) or above.

REGISTRATION FOR COURSES

The standard schedule for the freshman year must include the following courses:

Freshman Orientation Course.....	1
Physical Education.....	0
English, Introductory Course (or its equivalent).....	6
Biological Sciences 101-102 or 103-104.....	6
Chemistry or Physics.....	6
Elective courses in the College of Agriculture.....	6
Elective courses in the basic sciences, in social sciences and humanities, or in the College of Agriculture.....	3-6

In making his program, the student has the assistance of a faculty adviser, preferably from the field in which he expects to specialize. The adviser is ordinarily assigned to the new student for the first term, but following that he is chosen by the student. Other counselors to assist students on personal matters, vocational guidance, and placement are available in the Office of Resident Instruction, Roberts 192.

A student must register for at least twelve hours each term, and no new student may register for more than eighteen hours in addition to the regular work in physical education and military training.

Failures in courses, either required or elective, taken outside the College of Agriculture are counted against the allotment of the twenty free hours that may be taken in any college.

Senior students who have met all college requirements and desire to take courses outside the College of Agriculture in addition to those required or allowed free may do so upon paying for the additional hours at the rate of tuition prevailing in the colleges in which the courses are taken. Other students are not allowed to exceed, even by paying for the excess hours, the 20 hours of endowed college courses charged to this category unless they have met, or at the same time are meeting, the minimum agricultural elective requirement. Senior students whose cumulative averages place them in the top 15 per cent of their class and who are recommended by the department in which their major work is done may be permitted to elect, without additional payment, up to 10 hours in basic science outside the College of Agriculture beyond the 20 hours normally allowed for election in any college.

Courses in Advanced ROTC may be taken, in addition to the twenty hours of free electives outside the College, without payment for those excess hours.

The curriculum for provisional candidates shall include the following:

Physical Education	No credit
Education 7—Reading and Study Skills	No credit
Orientation 101	1 hr.
Communications (Instruction in speaking, writing, and literature)	0 to 6 hrs.
Chemistry	5 to 6 hrs.
Mathematics	0 to 6 hrs.
Agricultural Electives	10 to 20 hrs.

The actual courses which will be used to fill the requirements in the communications, chemistry, and mathematics areas will be dependent upon what college courses are offered in these areas.

The Selection Committee will review the records of all students who complete the one-year provisional curriculum and will inform those who request admission to the degree program whether they may be admitted. In order to be admitted to degree status in this curriculum, students will be expected to earn a quality point average somewhat higher than would have been required to remain in college had they been admitted originally to the degree course. Those students who are not admitted to degree status will be issued one-year certificates if the required courses in the curriculum have been completed satisfactorily and if 30 semester hours of credit have been passed.

COURSES IN AGRICULTURE OPEN TO FRESHMEN

Agricultural Economics 150
 Agricultural Engineering 104, 106,
 204, 205, 222, 233
 Agronomy 111
 Animal Science 100, 112, 250, 260, 270
 Biological Sciences 101-102, 103-104,
 270
 Conservation 110, 201, 301
 Drawing (freehand) 109-110, 111
 Entomology 195

Floriculture and Ornamental Horti-
 culture 101, 102
 Food Science 100
 Meteorology 201
 Orientation 5, 101, 110 or 111
 Pomology 101, 102
 Poultry Science 100, 121, 151
 Rural Education 110
 Rural Sociology 100
 Vegetable Crops 103, 210, 222

COMBINED COURSES

Professional Agricultural Engineering

A joint program of the Colleges of Agriculture and Engineering at Cornell University leads to the degree of Bachelor of Science at the end of four years. Students in this program register in the College of Agriculture during the first three years but take courses in the Colleges of Engineering, Arts and Sciences, and Agriculture. In the fourth year the registration is in the College of Engineering which recommends the candidates to the Trustees of the University for the degree.

Applicants for admission must meet the academic entrance require-

ments of the College of Engineering. These are: 16 units including English, four units; one foreign language, two units; history, two units; elementary and intermediate algebra, two units; plane geometry, one unit; trigonometry, one-half unit; either advanced algebra, one-half unit, or solid geometry, one-half unit; chemistry, one unit, or physics, one unit (preferably both). It is recommended that the candidate offer advanced algebra, if possible, and that at least three of the elective units offered be in further study in language or history. The mathematics courses listed above may be taken as separate courses or may be included within four units of comprehensive college preparatory mathematics.

Each candidate for admission is required to take the Scholastic Aptitude Test of the College Entrance Examination Board and to request the Board to report the results to the Director of Admissions, Cornell University. Candidates are urged to take the tests in January of their senior year.

Applicants must also take the College Entrance Examination Board achievement tests in advanced mathematics and either physics or chemistry. These tests should be taken not later than March of the year of the applicants' entrance to college.

Since it is the purpose of this curriculum to train engineers for agriculture in its many relationships of buildings, soil and water management, machinery, manufacturing and processing of agricultural products and supplies, drainage, irrigation, and so on, evidence of interest in and background for engineering work in agriculture is a qualification for admission that is given careful consideration.

The curriculum includes basic work in biology, mathematics, physics, and chemistry; a well-rounded selection of courses in engineering science and technology, including agricultural engineering; courses in soils, crops, farm management, and other subjects in agriculture; and general studies to provide a broad and useful training.

Charges for tuition and fees, during the first three years in the curriculum, are the same as outlined on page 39, except that students in this combined course are required to take more courses outside the College of Agriculture than are permitted to other students, for which they must pay, on a credit-hour basis, as soon as the regular allowance has been used up. The amount of the charge depends upon the specific courses that are taken but is approximately a total of \$700 for residents of the state, who pay \$200 tuition a term. The additional charge for the excess out-of-college instruction in the case of nonresidents, who pay \$300 tuition a term, is approximately \$575. Payment for the excess hours begins in the second year, but the major part is paid in the third year. In the fourth year these students are subject to the tuition and General Fee charged in the College of Engineering, which at present are \$775 for tuition and \$200 for the General Fee each term.

Students in the agricultural engineering curriculum must satisfy the practice requirement, as described on pages 29-32 of this Announcement.

In applying for admission the applicant should indicate in the application, which should be sent to the Director of Admissions, that he

wants to enter the College of Agriculture for professional agricultural engineering.

The amount, time, and manner of payment of tuition, fees, or other charges may be changed by the Board of Trustees at any time without notice.

With Business and Public Administration

Properly qualified students of the College of Agriculture may, during their third year, apply for admission to a joint program between the College of Agriculture and the Graduate School of Business and Public Administration. Under this program, the student who is admitted may complete the requirements for the Bachelor of Science degree for the College of Agriculture at the end of his fourth year and for the degree of Master of Business Administration or degree of Master of Public Administration at the end of his fifth year. The student in this program must successfully complete a minimum of 30 hours of course work in the Graduate School of Business and Public Administration during the fifth year.

A careful selection of courses is necessary if the two degrees are to be earned in five years; so a student who is interested should plan his program with the help of the designated faculty adviser, beginning with the sophomore year. If the decision to apply is not made until later, consultation with the adviser is necessary to determine whether the requirements for the two degrees can be met in five years or if a longer time is needed.

The opportunity to receive these two degrees in five years, when the normal time is six years, is made possible by the inclusion in the fourth-year schedule of certain courses from the Department of Agricultural Economics that may be acceptable in lieu of certain first-year requirements by the Graduate School of Business and Public Administration. Similarly, the faculty of Agriculture accepts up to nine hours of courses in Business and Public Administration in the fourth year toward the satisfaction of the requirement in the social studies. These substitutions are allowed only to those who have been accepted for admission by the Graduate School of Business and Public Administration and who have their schedules approved by the College of Agriculture faculty adviser for this program.

In the fifth year the student registers only in the Graduate School of Business and Public Administration. The program of that year includes the remaining core subjects required of all students in Business and Public Administration, together with elective courses. The specific courses to be taken depend upon the career interests of the student and are determined in consultation with his adviser. At the beginning of this fifth year the student will select a concentration from such areas as: Industrial accounting, professional accounting, finance, international business operations, managerial economics, marketing, personnel management, production and operations management, quantitative analysis for managerial decision making, transportation, organizational theory

and behavior, and agricultural management. Options within the agricultural management area include: management of farm cooperatives, agricultural credit administration, agricultural industries, agricultural marketing, public policy and the administration of government agricultural programs, and management of natural resources.

During the first four years these students are subject to the tuition requirements of the College of Agriculture and in the fifth year to those of the Graduate School of Business and Public Administration.

For further details about this joint program and its admissions requirements reference should be made to the *Announcement of the Graduate School of Business and Public Administration*.

The College of Agriculture and the Graduate School of Business and Public Administration also cooperate in a special program in food distribution. This joint effort carries the sponsorship of the National Association of Food Chains. The majority of the students have been employed in the food distribution industry, but the program also attracts others. Qualified degree holders may enroll in the Graduate School as candidates for the Master of Science or Doctor of Philosophy degree, or in the Graduate School of Business and Public Administration as candidates for the Master of Business Administration degree (which requires two years of residence). Undergraduates register in the College of Agriculture as candidates for the Bachelor of Science degree. Others who are not interested in a degree enroll as special students in the College of Agriculture and are granted a certificate at the successful completion of one year of work.

With the School of Nutrition

A plan of the College of Agriculture and the Graduate School of Nutrition permits students of Agriculture, who qualify, to follow a curriculum that leads to the regular degree of the College of Agriculture at the end of the fourth year, and the degree of Master of Nutritional Science or Master of Food Science at the end of the fifth year. To meet the requirements for the two degrees in five years, instead of the normal time of six years, the student in Agriculture should start planning his program with the adviser for students of nutrition not later than the end of the freshman year. During the first four years of this program, students are subject to the tuition requirements of the College of Agriculture and in the fifth year to those of the School of Nutrition.

With the Veterinary College

Students who do their preveterinary work in the College of Agriculture and are accepted by the Veterinary College at Cornell University sometimes qualify for degrees from both colleges. This takes about seven years and is ordinarily done by spending the first three years in Agriculture followed by four in the Veterinary College, including a combined registration in Agriculture during the semester in which the re-

quirements for the B.S. degree are completed. The candidate must petition for combined registration prior to the beginning of the semester in which he qualifies for the degree.

PAYMENTS TO THE UNIVERSITY

TUITION

Tuition for undergraduate students pursuing full or special courses in the New York State College of Agriculture, who at the time of their matriculation are, and for at least twelve months prior thereto have been, bona fide residents of the State of New York, is \$200 per term.

Since physical presence in the state, especially for persons under age, by no means constitutes legal residence, applicants who are at all doubtful of their own right to qualify as New York State residents should address inquiries in advance to the Director of Resident Instruction in the College of Agriculture.

Students in the College of Agriculture who do not qualify as New York State residents are required to pay tuition of \$300 a term. Students transferring from the College of Agriculture to other colleges in the University must first make payment for the difference in tuition for the credit transferred.

Senior students desiring to take, while registered in the College of Agriculture, courses in other colleges in the University beyond those specifically required and also beyond the twenty hours allowed free may do so upon payment of tuition for the additional hours at the rate of tuition in the college in which the work is taken.

Tuition and fees become due when the student registers. The University allows ten days of grace from the first registration day of each term of the regular session. The last day of grace is printed on the bill for tuition and fees which the student is required to present at the Treasurer's Office.

Any student, graduate or undergraduate, who fails to pay his tuition, fees, and other indebtedness within the time prescribed by the University is thereby dropped from the University. When in his judgment the circumstances in a particular case so warrant it, the Treasurer may allow an extension of time to complete payments. For such extension, the student is assessed a fee of \$5. A reinstatement fee of \$10 is assessed in the case of any student who is permitted to continue or return to classes after being dropped from the University for default in payments. For reasons satisfactory to the Treasurer and the Registrar, which must be presented in writing, the above assessment may be waived in any individual case. If the student withdraws, University fees are charged on the basis of 10 per cent for each week or fraction thereof in attendance.

No student is allowed to transfer from any unit to another unit in Cornell University without first paying the difference in tuition for the credit transferred.

The amount, time, and manner of payment of tuition, fees, or other

charges may be changed by the Board of Trustees at any time without notice.

FEES AND INSTRUCTIONAL EXPENSES

A DEPOSIT OF \$45 must be paid after the applicant has received notice of provisional acceptance. At the time of the first registration in the University, the deposit is used to cover matriculation charges, provides for certain graduation expenses, and establishes a fund for undergraduate and alumni class activities. The deposit is not refundable.

A DEPOSIT OF \$30 is required for a uniform, payable at registration in the first term, for students who enroll in the basic course in military science. Most of this deposit is returned as earned uniform allowance upon completion of the basic course.

A GENERAL FEE of \$100 for New York State residents, and \$200 for nonresidents, is required at the beginning of each term. This fee and the tuition cover the following services: (1) *Health services and medical care* (see page 160). (2) *Willard Straight Hall membership*. Willard Straight Hall is the student union; each student shares in the common privileges afforded by the operation of Willard Straight Hall, subject to regulations approved by the Board of Managers of the Hall. (3) *Laboratory services* for courses taken in the state colleges. (4) *University administration and endowed college laboratory services*. (5) *Physical recreation*. Each male student is entitled to the use of the gymnasium and the University playgrounds, and to the use of a locker, showers, and towels in Teagle Hall, Barton Hall, or the Schoellkopf Memorial Building; and each woman student to the use of the facilities in Helen Newman Hall, the women's physical education and sports building. (6) *Student activities*. The fee helps to provide funds for worthy student organizations as approved by the Board of Trustees on recommendation of the Executive Board of the Cornell Student Government.

BOOKS, instruments, and instructional supplies may cost from \$25 to \$50 a term.

MISCELLANEOUS RULES AND ASSESSMENTS

Every student is held personally responsible for any injury done by him to any of the University's property.

Assessments, charged to the student's account and payable at the Treasurer's office, are levied upon the student in certain circumstances, under the following rules of the University: (1) A matriculated student desiring to register after the close of registration day must first pay a fee of \$10. (2) A student desiring to take an examination or other test for the completion of a course in which the grade "incomplete" was reported must first pay a fee of \$2 for each examination or other test.

For reasons satisfactory to the proper authority, any of the above-

mentioned assessments may be waived in any individual case if the student's failure to comply with the regulation was due to ill health or to any other reason beyond his control. Application for such a waiver should be made to the Secretary of the College.

STUDENT HOUSING AND DINING

UNDERGRADUATE STUDENTS

MEN. Cornell University provides, on the campus, dormitory facilities for about 2100 men. Complete cafeteria and dining service is provided in Willard Straight Hall, Noyes Lodge, Baker Cafeteria, Martha Van Rensselaer Cafeteria, and Stocking Hall (Dairy Bar) Cafeteria. Male students are not required to live in dormitories and are individually responsible for making their own living and dining arrangements. As a matter of convenience for those who wish to live in dormitories, application forms will be mailed to each male candidate for admission as a freshman or a transfer student at the time of notification of provisional acceptance to the University.

Housing in dormitories can be guaranteed for all freshman men who have been admitted to the University and have filed dormitory applications by May 15.

Off-campus housing may be obtained in private homes and rooming houses. The University, as a service to students, maintains a listing of available rooms and apartments. Inquiries should be addressed to the Off-Campus Housing Office, Day Hall.

WOMEN. The University provides dormitories for the housing of undergraduate and graduate women. These residence units are supplemented by sorority houses in areas close to the dormitories. With few exceptions all undergraduate women students are required, under University policy, to live and take their meals in a University residence unit or in a sorority house (for members only). Permission to live elsewhere in Ithaca is granted only under exceptional circumstances upon written application to the Office of the Dean of Students, Day Hall.

An application form for living accommodations for undergraduate women will be sent with the notice of provisional acceptance from the Office of Admissions to each candidate.

Graduate women should make application for University dormitory housing directly to the Department of Housing and Dining Services.

MARRIED STUDENTS

The University, through the Department of Housing and Dining Services, maintains apartment accommodations for some of its married students and their families. These are Cornell Quarters, Pleasant Grove Apartments, and Hasbrouck Apartments, with total housing for about 400 families. All apartments are unfurnished. For further information

and application, write the Department of Housing and Dining Services, Day Hall.

The Department of Housing and Dining Services also maintains a list of available rental housing in the Ithaca area. Information on housing currently available can be obtained only at the Off-Campus Housing Office in Day Hall. Lists cannot be sent out as changes occur daily.

GRADUATE STUDENTS

University dormitory housing is available to single graduate students upon application to the Department of Housing and Dining Services, Day Hall. Married graduate students may apply to the Manager of Housing, Department of Housing and Dining Services, for University-operated housing. Applications for all University housing should be made as soon as possible after January 1 for all fall matriculants; after October 1 for spring matriculants. Detailed information concerning University housing may be obtained by writing to the Department of Housing and Dining Services.

Sage Hall, the graduate center, provides dormitory housing for approximately 200 men and women. Situated in the center of the campus, it is convenient to all colleges. There is a cafeteria in the building.

Cascadilla Hall, located at the southwest entrance to the Campus, is a graduate dormitory for men housing 160 students.

Rooms and apartments adjacent to the campus or in the downtown area are available in limited number. Students desiring off-campus housing should arrange to come to Ithaca well in advance of the term opening to arrange such accommodation. Inquiries may be directed to the Office of Off-Campus Housing, Day Hall.

DEPARTMENTS OF INSTRUCTION

With Outlines of Courses That May Be Chosen By Regular or Special Students As Agricultural Electives

Special notice. Unless otherwise noted, all courses are given in the buildings of the College of Agriculture. Courses enclosed in brackets will not be given in 1966-67.

The present system of numbering courses was initiated in the College of Agriculture in 1964-65. Courses numbered 100 through 199 are introductory courses primarily for freshmen and sophomores; courses numbered 200 through 299 are intermediate courses primarily for underclassmen; courses numbered 300 through 399 are advanced courses primarily for juniors and seniors; courses numbered 400 through 499 are primarily for seniors and graduate students; courses numbered 500 through 599 are primarily for graduate students; and courses numbered 600 through 699 are seminar courses.

ORIENTATION

5. ORIENTATION

Fall or spring term. Credit three hours. The credit is not counted toward the 120 hours required for the degree. Fall term: for entering students only, M W F 9 or 10 or T Th S 9. Warren 37. Spring term: may be elected by first- or second-year students only. M W F 12. Warren 160. Mr. Forgette.

Emphasis on the analysis and reasoning involved in the solution of verbal problems which have been drawn mainly from College of Agriculture courses requiring the use of mathematics.

101. ORIENTATION

Fall term. Credit one hour. Required of all freshmen in Agriculture. One lecture-discussion period a week. M 10, 11; T 10; W 9; Th 10; F 9, 10, or 11. Warren 160 or 201. Professors Harden, Hertel, and Tyler.

110. INTRODUCTORY COLLEGE MATHEMATICS

Fall or spring term. Credit three hours. T Th S 8. Warren 37. M W F 8, 12. Warren 131. Associate Professor Geiselmann.

Designed to give students with a sound high school mathematics background a unified treatment of the basic ideas of college algebra, trigonometry, and analytic geometry. Selection of topics will be made from the following:

- (a) Exponents, radicals, logarithms, and the slide rule.
- (b) Quadratic and higher degree equations.
- (c) The binomial theorem, permutations, combinations, and probability.
- (d) Determinants, mathematical induction, topics from analytic geometry, and topics from trigonometry.
- (e) Maxima, minima, limits, curve tracing.

Throughout the course considerable emphasis will be placed upon the concept of function, graphing, problem solving, and methods of proof. A term paper will be required.

111. APPLIED CALCULUS

Fall or spring term. Credit one hour. Registration restricted to students who are also enrolled in Mathematics 111 (Arts & Sciences). Enrollment limited to twenty-five students. Th 7-9 p.m. Warren 37. Associate Professor Geiselmann.

Designed for students in agriculture who are enrolled in Mathematics 111 (Arts & Sciences) and who should profit from an extended treatment of the topics covered. Special emphasis will be placed on the application of analytic geometry and differential and integral calculus to the problems encountered in agricultural and related sciences. One hour of lecture and discussion followed by a one-hour computation period.

AGRICULTURAL ECONOMICS

Farm Management

302. FARM MANAGEMENT

Spring term. Credit five hours. Lectures, M W F 10. Warren 45. Laboratory: T W Th or F 2-4. Warren 101. On days when farms are visited, the laboratory period is 1:30-5:30. Professor Warren.

A study of the organization and operation of the farm from the point of view of efficiency and continuous profit; farm records, farm business analysis,

factors affecting profits, size of business, choice of enterprises, partnership arrangements, getting started in farming, planning the organization and management of specific farms. One all-day trip and five half-day trips are taken to visit farms in near-by regions.

402. FARM MANAGEMENT

Spring term. Credit three hours. Prerequisite, Course 302, or its equivalent. Lecture, W 10. Laboratory, W 2-4. Warren 160. On days when farms are visited, the laboratory period is 1-5:30. Professor Cunningham.

Study of the organization and operation of major types of farms in different regions of New York State. Visits to farms and analysis of operations are made to show the application of farm management principles.

403. FARM COST ACCOUNTING

Fall term. Credit three hours. Prerequisite, Course 302. Lectures, M W 10. Laboratory, W 2-4. Warren 160. Brief weekly conferences to be arranged. Professor Kearl.

Cost-accounting methods and procedures as applied to farms. Topics considered are the organization of accounts, methods of cost determination and allocation, summarization and analysis of accounts, making financial and operating statements, and studying the farm business.

405. FARM FINANCE

Spring term. Credit three hours. Prerequisite, Course 302. Lectures, T Th 10. Discussion, T 2-4. Warren 145. Professor Smith.

A study of sound financial arrangements for farmers and the credit institutions which serve them. Emphasis is placed on problems of capital management associated with organizing and operating a commercial farm. Alternative sources of capital are analyzed and consideration given to safe and profitable debt levels and selection of alternative investment opportunities. Insurance programs, family financial planning, and retirement and estate planning for farmers are also studied.

406. FARM APPRAISAL

Fall term. Credit three hours. Prerequisite, Course 302. Lecture, T 10. Laboratory, T 1-5. Warren 101. Professor Warren.

A study of factors governing the price of farms, methods of farm valuation, and practice in the appraisal of farms.

408. PRODUCTION ECONOMICS

Spring term. Credit three hours. Prerequisites, Economics 103-104. Lectures, T Th 11. Warren 37. Discussion, W 3. Warren 201. Assistant Professor Casler.

An application of economic principles to problems of production. Topics covered include production functions, cost curves, risk and uncertainty as they apply to farms and business firms.

500. FARM ORGANIZATION IN THE UNITED STATES

Fall term. Credit three hours. Enrollment limited to graduate students from countries other than the United States and Canada. Lecture, W 10. Laboratory and field trips, W 1:30-5:30. Warren 101. Professor Warren.

A study of the organization and operation of farms in the United States, from the point of view of efficiency and continuous profit. Intended to acquaint students from other countries with farm organization in the United States in order to serve as a basis for deciding on the adaptation of United States ideas to the circumstances of other regions. Visits to representative farms and the analysis of their business records. Attention will be given to the uses of farm management research studies.

507. FARM MANAGEMENT RESEARCH METHODS

Fall term. Credit two hours. Open only to graduate students. F 2-4. Warren 232. Professor Stanton.

A discussion of problems and methods used in doing research. Emphasis is placed on the organization of research projects, sources and methods of obtaining data, sampling, and the different methods of analyzing data commonly used by research workers in this field.

508. FARM RESOURCE ALLOCATION

Fall term. Credit three hours. Open only to graduate students. Lectures, M W F 12. Warren 160. Professor Robinson.

A review of economic theory, statistical methods, and empirical studies applicable to resource allocation problems in agriculture. Topics discussed include production functions, linear programming, interindustry studies, and game theory.

Prices and Statistics

Attention is directed to courses in mathematics and statistics in the Colleges of Arts and Sciences and Engineering and in the School of Industrial and Labor Relations.

314. INTRODUCTORY STATISTICS

Fall term. Credit three hours. Lectures, T Th 11. Warren 45. Discussion, M W or Th 2. Warren 145. Computing period of one hour to be arranged in the afternoon or morning following the discussion section, M W or Th 3, or T or Th 10 or F 11. Warren 360. Professor Stanton.

An introduction to procedures and methods of analysis used in the study of agricultural and economic data. Frequency distributions, measures of central tendency and dispersion, index numbers, time series analysis, simple regression and correlation, point and interval estimation, and tests of hypotheses are covered.

315. PRICES

Spring term. Credit three hours. Prerequisite, Economics 103. Statistics at the level of Course 314 is helpful, although not required. Lectures, M W F 8. Warren 145. Assistant Professor Tomek.

A study of commodity prices including the economic forces affecting price and the institutional framework within which pricing takes place. This is an applied course with price theory used as a guide. Elementary methods of price analysis are discussed.

515. PRICE ANALYSIS

Spring term. Credit three hours. Prerequisite, preparation in economics and statistics at the level of Economics 311-312 and I. and L.R. 311. T Th 1:40-3:00. Warren 37. Assistant Professor Tomek.

A course in applied econometrics with examples drawn from price-demand-supply structures for agricultural commodities. Topics covered include model specification, the identification problem, estimation techniques, and the use of results.

Business Management

Attention is directed to courses in economics and mathematics in the College of Arts and Sciences and in administration in the Schools of Hotel Adminis-

tration, Business and Public Administration, and Industrial and Labor Relations.

221. ACCOUNTING

Fall term. Credit three hours. Lectures, M F 10. Warren 45. Laboratory, T or Th 8-10; M T W or Th 2-4. Warren 201. First class of term on Friday. Professor Carpenter.

A comprehensive survey of basic accounting principles. Some analysis and interpretations of financial statements with special emphasis on agricultural businesses.

222. ACCOUNTING

Spring term. Credit three hours. Prerequisite, Course 221 or its equivalent. Lectures, T Th 11. Warren 45. Laboratory, W 11-1, T or W 2-4. Warren 260. Associate Professor Goodrich.

Consideration of corporation and partnership accounting; manufacturing cost systems; tax, inventory, depreciation, and price level problems as they affect income determination; preparation and interpretation of financial statement data. Emphasis is placed on special problems of agricultural business.

320. BUSINESS LAW

Fall term. Credit three hours. Lectures, M W F 9. Warren 231. Limited to upperclassmen.

Consideration is given chiefly to legal problems of particular interest to persons who expect to engage in business, including contracts, liens, mortgages, and negotiable instruments; automobile and other insurance; ownership and leasing of property; wills; estates; inheritance taxation; and other practical problems.

326. FARMERS' COOPERATIVES

Spring term. Credit three hours. Lectures, M W 9. Warren 45. Discussions, W or Th 2-4. Warren 145. Professor Carpenter.

What cooperatives are, what they have tried to do, and what they have done; their legal status and special problems of organization, finance, and control.

327. BUSINESS MANAGEMENT

Fall term. Credit three hours. Limited to upperclassmen. Lectures, T Th 10. Warren 231. Discussion, T or Th 2-4. Warren 160. Associate Professor Brown.

An introductory course in business management. Emphasis is placed on the development of a conceptual framework encompassing management concepts and principles. The functions of management are studied under the headings of planning, organization, staffing, direction and control. Although these functions are applicable in all types of organizations, special attention is given to their application in business firms.

328. ECONOMICS OF MANAGERIAL DECISIONS

Spring term. Credit three hours. Prerequisites, Economics 103 and Course 221 or their equivalents. Lectures, M W F 9. Plant Science 233. Discussion, W (Warren 160) or Th 2-4 (Warren 31), Th 8-10, Th 10-12, F 9-11 or F 11-1 (Warren 201). In weeks when discussions are held, there will be no Friday lecture. Associate Professor Aplin.

Emphasis is placed on identifying problems in a business, recognizing alternatives, and using economic data as guides to making decisions. Principal topics considered include cost analysis, with emphasis on identifying costs relevant for various decisions within the firm; pricing policies of firms; planning capital investments and sales forecasting. Class discussion is supple-

mented by case studies to illustrate concepts and techniques available to management to assist them in making sound decisions. Primary emphasis is on conceptual and qualitative approaches, not on quantitative methods.

425. PERSONAL FINANCIAL MANAGEMENT

Spring term. Credit one hour. Primarily for seniors. Lecture, F 12. Warren 145. Three evening discussion sessions during the term to be arranged. Professor R. S. Smith and Associate Professor E. H. Brown.

Identification and analysis of problems in personal financial management common to young families. A study of income flows into the budget and financial demands on family resources. Personal income and budgeting, consumer credit, asset acquisition, personal insurance programs, savings and investments, basic elements of retirement and estate planning.

626. SEMINAR IN AGRICULTURAL COOPERATION

Spring term. Credit two hours. Open only to graduate students. Time to be arranged. Warren 204. Professor Carpenter.

A discussion of the economic theory concerning farmer cooperatives. Special attention is given to problems of financing, management, control, and membership relations peculiar to farmer cooperatives.

Public Administration and Finance

Attention is directed to course offerings in the Departments of Economics, Government, Sociology, and Anthropology in the College of Arts and Sciences and to courses in administration and finance in the School of Business and Public Administration.

330. LOCAL GOVERNMENT

Fall term. Credit three hours. Lectures, T Th 9. Warren 145. Discussion period, T or Th 2-4. Warren 31. Professor Lutz.

Government in the United States with emphasis upon examination, analysis, and resolution of public issues confronting leadership in areas of New York. Government organization, administration, functions, and finance are discussed in this context.

338. TAXATION

Fall term. Credit three hours. Lectures, M W F 11. Caldwell 100. Assistant Professor Luykx.

A study of the principles and practices of public finance, with emphasis on taxation. The topics examined include the role of government services and the need for public revenue; factors influencing choice of taxes; and the practices and issues associated with the various taxes on personal and business income, on property, and on commodity transactions.

637. ADMINISTRATION OF PUBLIC AGRICULTURAL PROGRAMS

Spring term. Credit two hours. Primarily for graduate students. Undergraduate registration by permission of the instructor. F 2-4. Warren 260. Professor Lutz.

An examination of government organizations for administering and financing public agricultural programs; a study of some problems of administration and finance, including organization of agencies, management of personnel, budgetary management, interagency relationships (national, state, and local), and relationships among national, state, and local levels of government. Course 330 or one or more courses in government and public administration are desirable before taking this course.

Marketing and Food Distribution

240. MARKETING

Fall or spring term. Credit three hours. Lectures, M W F 11; one discussion period only, during the first week of the term: M T W Th or F 2-4 or S 9-11. Warren 45. Professor Darrah.

A study of how food products are marketed. Special attention is given to the consumption of food products, factors that affect consumption, market channels, operation of different marketing agencies, storage, transportation, packaging, product identification, advertising and promotion, buying, selling, and costs.

346. MARKETING MILK AND DAIRY PRODUCTS

Fall term. Credit three hours. Lectures, M W 11. Warren 345. Discussion period, F 11-1. Warren 260. Professor Story.

A review of the economic characteristics of the dairy industry, and an analysis of the marketing and pricing systems for market milk. Particular attention will be given to problems and resulting government programs, including marketing orders, price support operations, and public regulation of competition.

347. MARKETING INSTITUTIONS.

Spring term. Credit two hours. Prerequisite, Course 240 or its equivalent. Enrollment limited to 40. M 12. Warren 245. Professor Dominick.

Economic functions performed by various types of specialized marketing agencies, with an emphasis on their physical operating patterns. Five days of spring vacation are spent in New York City inspecting and studying the major terminal marketing institutions. Total cost of the trip need not exceed \$50 in addition to transportation to and from New York.

441. FOOD DISTRIBUTION

Fall term. Credit three hours. Open only to seniors and graduate students. Prerequisites, Courses 327 and 240. M W F 10. Warren 245. Professor Earle.

An analysis of the factors affecting food distribution costs, prices, and the consumption of food products; a study of the structure and the changing pattern of the food industry, with a description and analysis of the services performed by the various marketing agencies.

442. SPECIAL TOPICS IN FOOD DISTRIBUTION

Fall term. Credit two hours. F 2-4 p.m. Warren 401. Professor Earle.

Leading authorities in the food industry are guest discussion leaders. Emphasis is placed on the relation of the food industry to the economy and sources of supply, and on a descriptive survey of the functions and trends among marketing organizations in the food industry. Topics discussed are concurrent with those in Course 441.

443. FOOD INDUSTRY MANAGEMENT

Spring term. Credit three hours. Open only to seniors and graduate students. Prerequisite, Course 441. M W F 10. Warren 245. Professor Earle.

A study of management principles as they apply to the operation of organizations in the food industry.

444. SPECIAL TOPICS IN FOOD INDUSTRY MANAGEMENT

Spring term. Credit two hours. F 2-4 p.m. Warren 401. Professor Earle.

Leading authorities of the food industry are guest discussion leaders. Emphasis is placed on the management aspects of operating and coping with the problems of firms in the food industry. Topics discussed are concurrent with those in Course 443.

445. FIELD STUDY OF FOOD INDUSTRIES

Spring term. Credit two hours. Registration by permission. W 12. Warren 245. Mr. German

Observations are made of the organization and operating of businesses in the food industry. Trips are made to manufacturers, processors, wholesalers, and retail firms throughout the term. Four days of spring vacation are spent in New York City and Philadelphia visiting food distribution firms.

540. INTRODUCTION TO MARKETING RESEARCH

Spring term. Credit two hours. Limited to graduate students. M 2-4. Warren 201. Professor Brunk.

Objectives of marketing research, organization of research agencies, selecting and planning projects, preliminary investigation procedures, surveys, experimental designs, methods engineering, case studies, field and office supervision, preparation of reports, and application of results.

541. FOOD MERCHANDISING AND PROMOTION

Fall term. Credit two hours. Limited to graduate students. T 2-4. Warren 345. Professor Brunk.

A seminar course exploring alternative merchandising and promotional devices used in the foods industry with special attention given to identification and measurements of basic forces having an impact on buying behavior.

640. MARKET ORGANIZATION AND STRUCTURE

Fall term. Credit two hours. Open only to graduate students. Registration by permission. M 2-4. Warren 345. Professors Story and Brunk.

A seminar course exploring the relationship of market organization and structure to the combined efficiency of production and marketing processes. Alternative market structures will be examined with respect to supply arrangements, market outlets, business considerations, and environmental conditions.

646. SPECIAL PROBLEMS IN MILK MARKETING

Spring term. Credit two hours. Open to graduate students and selected seniors. Time to be arranged. Professor Story and Associate Professor Aplin.

Special topics relating to the dairy industry will be selected for study.

648. QUANTITATIVE METHODS IN MARKETING

Spring term. Credit two hours. Open to graduate students only. Time to be arranged. Professor How.

The application of quantitative methods to the improvement of decisions in agricultural marketing. Methods discussed will depend on class interest and available time, but may include Markov processes, queuing models, project evaluation and review technique, and dynamic programming. Reports of published research will be reviewed to determine the suitability of the technique to the particular problem situation. Class participation will be expected.

Agricultural Policy and Land Economics

150. THE ECONOMICS OF AGRICULTURAL GEOGRAPHY

Fall term. Credit four hours. Lectures, M W F 9, or M W F 12, Warren 45. Discussion, W Th or F 2-4, or Th 7-9. Warren 345. Assistant Professor Sisler.

The economics and geography of the world's agriculture, providing a basis for understanding past development and future changes in agriculture. Elementary economic principles, historical development, physical geography,

and population growth are studied in their relation to agricultural development and the economic problems of farmers. Particular emphasis is placed upon study of the agriculture of various farming regions of the United States, their economic problems and competitive situation.

351. AGRICULTURAL POLICY

Fall term. Credit three hours. Two lectures plus one discussion section each week. Lectures, T Th 9. Warren 45. Discussion sections, Th 11 or 2, or F 10 or 2. Warren 260. Professor Robinson.

A review of the history of public policies affecting agriculture in the United States and an analysis of the economic effects of alternative farm policies or programs, either proposed or adopted. Among the topics discussed are farm price supports, surplus disposal programs, trade policies affecting agriculture, credit, and land tenure issues and farm politics.

452. AGRICULTURAL LAND ECONOMICS

Spring term. Credit four hours. For undergraduates, Courses 150 and 302 should precede or accompany this course. Lectures, M W F 9. Warren 245. Discussion and laboratory, T or Th 2-4. Warren 160. When field trips are taken the laboratory period is 1-5:30. Professor Conklin.

Physical land variability, systems of physical land classification, fundamental economic concepts, traditional and revised theories of land use and farming returns, systems of economic land classification, patterns of change in land use, the effect of institutional arrangements upon land use, problems of conservation, and factors involved in land-policy formation. Five field trips are taken.

552. SPECIAL PROBLEMS IN AGRICULTURAL LAND ECONOMICS

Fall or spring term. Credit one or more hours. Open only to graduate students. Prerequisite, Course 452 and permission of the instructor. Professor Conklin.

Special work on any subject in the field of land economics that is of particular interest to the student. The student normally is expected to prepare a report on his work that is suitable for mimeograph reproduction and distribution.

644. SEMINAR IN AGRICULTURAL LOCATION THEORY

Spring term of even-numbered years. Credit two hours. Open only to graduate students. F 8-10. Warren 448. Professor How and Assistant Professor Sisler.

Theories of the location of agricultural production and marketing facilities and methods used in making regional location decisions. Contributions of economic theory and quantitative methods will be reviewed. Analysis will be made of selected studies of interregional competition and the location and scale of marketing facilities.

651. SEMINAR IN AGRICULTURAL POLICY

Spring term. Credit two hours. Open only to graduate students. F 2-4. Warren 160. Professor Robinson.

An analysis of current agricultural policies and proposed programs in the United States and selected foreign countries.

652. PRINCIPLES OF RESEARCH IN AGRICULTURAL PRODUCTION ECONOMICS.

Spring term. Credit three hours. Open only to Ph.D. candidates. S 9-12. Warren 260. When field trips are taken, S 9-6. Professor Conklin.

The general problem of acquiring knowledge; major philosophical patterns of thought including rationalism, empiricism, relativism, and experimentalism; the past research continuum in agricultural production economics; the

forces that guide choices among research alternatives; current research and future possibilities. Field trips are designed to supplement discussions of actual and possible research efforts.

Economics of Agricultural Development

364. ECONOMICS OF AGRICULTURAL DEVELOPMENT

Spring term. Credit three hours. Prerequisite, Course 150, Economics 103-104, or consent of the instructor. Lectures, T Th S 9. Warren 345. Professor Mellor.

A discussion of the special problems of agricultural development, in low per-capita income areas and countries. Attention will be devoted to the relationship between development in agriculture and in other sectors of the economy, capital and capital formation, the role of land and land reform, increasing efficiency in resource use, coordination problems in agricultural development, and the like.

560. ECONOMIC ASPECTS OF THE WORLD'S FOOD

Spring term. Credit three hours. Given in odd-numbered years. Primarily for graduate students, but open to seniors with permission of the instructor. Prerequisite, basic economics and a course in economic development. Time to be arranged. Assistant Professor Poleman.

Designed for students in economics and agricultural economics who are interested in the problems associated with quantification of the "Malthusian dilemma." Briefly considered are human food requirements, the major food groups, and the geography of world food production and consumption. Also examined are national diets and historical trends in food consumption. Prime attention is devoted to techniques for data evaluation, including food balance sheets and consumption surveys, and the interrelations between population, food and economic progress.

664. SEMINAR ON THE AGRICULTURAL DEVELOPMENT OF SOUTH ASIA

Spring term. Credit two hours. Open only to graduate students who have completed Course 364 or its equivalent. Times to be arranged. Professor Mellor.

665. SEMINAR ON LATIN AMERICAN AGRICULTURAL POLICY

Fall term. Credit two hours. Prerequisite, basic economics, a course in economic development, and permission of the instructor. A knowledge of Spanish or Portuguese is highly desirable. Time to be arranged. Professor Barraclough and Associate Professor Freebairn.

An examination of policies for the development of agriculture in Latin America including treatment of land tenure, the planning process, and related topics.

667. SEMINAR ON THE ECONOMICS OF TROPICAL AGRICULTURE

Spring term. Credit three hours. Given in even-numbered years. Primarily for graduate students, but open to seniors with permission of the instructor. Prerequisite, basic economics and a course in economic development. F 2-3:30, plus a weekly meeting with the instructor. Warren 31. Assistant Professor Poleman.

An examination of the production, distribution, and consumption of agricultural commodities in tropical countries. Emphasis will be on statistical sources and methods for their appraisal. Student participation and the preparation of a research paper will be stressed.

668. SEMINAR IN THE ECONOMICS OF AGRICULTURAL DEVELOPMENT.

Fall term. Credit two hours. Open only to graduate students with permission. Time to be arranged. Professors Barraclough, Conklin, and Mellor, Associate Professors Call and Freebairn, and Assistant Professors Poleman, Sisler, and other staff.

A joint exploration by the departmental staff in international agriculture of current topics in economic development with respect to agriculture. Intended primarily to facilitate the exchange of ideas among staff members, the seminar will be open to a limited number of advanced graduate students. Each student participant will be expected to prepare and defend a paper on a topic associated with his dissertation research.

Other

499. UNDERGRADUATE RESEARCH

Fall and spring terms. Credit one to three hours depending upon the problem undertaken and the extent and quality of work done. A student desiring to register must obtain the written permission of a professor who will supervise the work. Open to seniors with grade averages of 80 or higher. Designed to afford opportunities for outstanding undergraduates to carry out independent studies of suitable problems under appropriate supervision.

690. SEMINAR IN AGRICULTURAL ECONOMICS EXTENSION

Fall term. Credit two hours. Primarily for graduate students. M 2-4. Warren 448. Professor C. A. Bratton.

The scope and nature of agricultural economics extension work will be considered. This will include early development of extension work in agricultural economics, objectives of agricultural economics extension; how programs are developed; extension methods used; and the importance of coordinating research and extension projects.

Current economic extension programs will be examined in detail.

The seminar is designed to familiarize students with the extension phase of agricultural economics.

AGRICULTURAL ENGINEERING

Students in the College of Agriculture with a major interest in a semitechnical agricultural engineering program may elect a varied sequence of courses that will prepare them for opportunities with many of the industries, organizations, and agencies serving agriculture or for farming enterprises which increasingly require understanding and application of engineering principles. A suggested sequence of courses may be obtained directly from the department.

Students interested in a professional career in agricultural engineering for research, teaching, extension, design, product development, and manufacturing must take a prescribed sequence of courses that leads to a degree granted by the College of Engineering. The detailed curriculum may be found in the *Announcement of the College of Engineering*.

104. ELEMENTS OF AGRICULTURAL ENGINEERING

Fall or spring term. Credit three hours. Lectures, T Th 10. Recitation period, F 11 or 12. Riley-Robb 125. Laboratory, M T Th or F 2-4:30. Riley-Robb 160. Mr. Townsend.

An introductory course covering basic principles of farm structures, electric power and processing, soil and water conservation, and power and machinery. Some of the topics included are farm wiring, electric motors, elementary statics and structural design, refrigeration, water pumps and systems, internal combustion engines, machinery, and soil and water engineering problems. Emphasis is placed upon the application of basic physical principles to the solution of agricultural engineering problems.

106. MECHANICAL DRAWING

Fall term. Credit three hours. Lectures, T Th 8. Riley-Robb 105. Laboratory: W 1:40-4:30 or Th 1:40-4:30. Riley-Robb 425. Limited to 40 students per laboratory. Book and supply lists are available at the book stores. Mr. Longhouse.

Graphic presentation, including lettering, use of instruments; orthographic projection of multiview drawings including sections, auxiliaries, plans and elevations; pictorial drawing, graphs and charts; elementary descriptive geometry; and the practical applications of these principles to simple problems. Both machine drawing and architectural drawing conventions and practices are discussed and employed in the solution of drawing problems.

107. ADVANCED MECHANICAL DRAWING

Spring term. Credit three hours. Prerequisite, Course 106 or sufficient high school drawing. Lectures, W F 8. Laboratory, Th 1:40-4:30. Riley-Robb 425. Limited to 40 students. Book and supply lists are available at the book stores. Mr. Longhouse.

A continuation of Course 106 with work on machine drawing, including assembly drawings; intersections; developments; descriptive geometry; sectional and auxiliary views; and the use of conventional practices and symbols. Also studied are graphical methods related to other engineering courses and practical engineering problems; these include engineering graphs and charts; nomography; vector geometry and graphical calculus.

The student will be allowed to perform much of his drawing work with the aid of drafting machines. Advanced drafting techniques are also discussed, illustrated, and employed as time permits.

152. INTRODUCTION TO AGRICULTURAL ENGINEERING MEASUREMENTS

Spring term. Credit three hours. Primarily for students in the professional engineering curriculum. One lecture, two laboratories. Time to be arranged. Professor Levine.

A study of the principles and methods of engineering measurements, fundamentals of measurement, sources of errors, and measurement systems will be considered, with emphasis upon surveying measurements. Special attention will be given to methods for obtaining needed measurements that are required in a variety of agricultural engineering design problems. Techniques for solution of these problems by modern digital computing methods will be introduced.

153. ENGINEERING DRAWING

Fall term. Credit three hours. Open only to professional engineering students. Lectures, M W 9. Laboratory, T 1-4:30. Riley-Robb 425. Mr. Longhouse.

Designed to promote an understanding of the engineer's universal graphic language. The lectures will deal primarily with spatial relationships involving the problem-solving techniques of descriptive geometry. The laboratories will develop a working knowledge of drawing conventions, standard and advanced drafting techniques, and their application to machine, architectural,

and pictorial drawing problems. Graphs and engineering graphics (nomography and graphical calculus) will also be included. Students will accomplish their work with drafting machines as well as the standard T-square and board. The first half hour of the laboratory will be utilized as an instruction-recitation period.

204. WOODWORKING AND CARPENTRY

Fall term. Credit two hours. Lecture, T 9. Riley-Robb 125. Laboratory, M T or Th 1:40-4:30 or Th 8-10:50. Riley-Robb 70. Limited to fifteen students per section. Associate Professor Lechner and Mr. Maynard.

Designed to acquaint the student with the woodworking, carpentry, concrete, tool-fitting, and wood-finishing jobs common to the farm and home. The skill in use of both hand and power tools is emphasized in the construction and repair of farm equipment. A field trip is included to a local woodworking plant and sawmill.

205. FARM METAL WORK

Fall or spring term. Credit two hours. Lecture, Th 9. Riley-Robb 125. Laboratory including metal lathe work, M 1:40-4:30. Laboratory not including metal lathe work, T or Th 1:40-4:30. Riley-Robb 60 and 64. Limited to 20 students per laboratory section. Associate Professor Lechner and Mr. Maynard.

Instruction and practice in the fundamentals of electric arc welding, oxyacetylene welding, sheet metal work, pipe fitting, hot and cold metal work, and metal lathe work as they apply to farm shop work for both repair and construction jobs.

222. FARM SURVEYING

Spring term. Credit three hours. Prerequisite, trigonometry. Lectures, T Th 9. Riley-Robb 105. Laboratory, M T or W 2-4:30. Riley-Robb 15. Associate Professor Black.

A study of the use and care of the simpler surveying equipment. Special emphasis is placed on its application to farm problems. This course cannot be substituted for the surveying requirement of the five-year agricultural engineering program.

233. FARM STRUCTURES

Fall term. Credit three hours. Prerequisites, intermediate algebra and physics. Lectures, M W F 8. Riley-Robb 105. Associate Professor Lorenzen.

A study of the facilities and equipment for livestock production and crop storage, with emphasis on farm buildings from the viewpoint of structural design, environment, and materials handling.

234. FARM STRUCTURES LABORATORY

Fall term. Credit two hours. Open only to agricultural engineering students who are currently taking or have previously taken Course 233 and Drawing 106. Laboratory, Th or F 1:40-4:30. Riley-Robb 325.

Two field trips start at 1 p.m. Limit 15 students per section. (Friday section open only when numbers require.) Associate Professor Lorenzen.

Practice in layout of livestock production facilities including field trips to typical installations. Problems in structural design, insulation and ventilation. Studies of wood and concrete as structural materials.

305. ADVANCED FARM METAL WORK

Fall or spring term. Credit one or two hours. Prerequisite, Course 205, its equivalent, or permission of instructor. Laboratory for one credit, F 1:40-4:00; for two credits, one additional 2½ hour laboratory to be arranged. Riley-Robb 60 and 64. Associate Professor Lechner.

Machine shop practice is offered in fall term. Advanced welding only, or welding together with metal construction or redesign project, is offered in spring term.

311. FARM MACHINERY

Fall term. Credit two hours. Not open to freshmen. Lectures, T Th 11. Riley-Robb 125. One recitation each week to be arranged Friday a.m. Riley-Robb 225. Professor Millier.

A study of the operating principles, use, selection, and methods of estimating costs of owning and operating farm machinery and equipment. Machines in each of the following groups are included: tillage, seeding, fertilizer application, pest control, harvesting, processing, and crop handling.

312. FARM POWER

Spring term. Credit three hours. Prerequisite, Course 104 or Physics 101 and 102, or the equivalent. Lectures, T Th 11. Riley-Robb 125. Laboratory, M T or Th 2-4:30. Riley-Robb 74. Assistant Professor Siemens.

A study of the principles of operation and adjustment of internal combustion engines and their farm applications. Principal emphasis on farm tractors, including care and operation, power transmission, power requirements, and economic factors.

[313. ELECTRICITY ON THE FARM

Spring term. Credit three hours. Given in alternate years. Prerequisite, Course 104 or Physics 102 or the equivalent. Lectures, T Th 10. Riley-Robb 105. Laboratory, T or Th 2-4:30. Riley-Robb 164. Professor Shepardson.] Not given in 1966-1967.

The application of electricity for light, heat, and power on farms, with emphasis on the principles of operation, selection, and installation of electrical equipment for the farmstead. Laboratory sections are combined for one half-day field trip.

314. FARM MACHINERY LABORATORY

Fall term. Credit two hours. Open only to agricultural engineering students currently taking or who have previously taken 311. Prerequisites, Physics 101 and 102 or equivalent. Laboratory, W 1:40-4:30. Riley-Robb 74. Professor Millier.

Designed to give the student practice in the calibration of seeding, fertilizing, and pesticide application machinery and to study the functional characteristics of agricultural machines and machine components.

321. SOIL AND WATER CONSERVATION

Spring term. Credit two hours. Prerequisite, Agronomy 200 or equivalent. Course 222 is recommended. Must be taken with agronomy 321. Lecture, F 9. Riley-Robb 105. Laboratory, M or T 2-4:30. Riley-Robb 72. Professor Levine.

A study of the principles and practices used in soil and water conservation. Engineering aspects of erosion control, water management and storage, drainage, and irrigation receive primary consideration. One all-day field trip is taken on a Saturday.

401. SPECIAL PROBLEMS IN AGRICULTURAL ENGINEERING

Fall or spring term. Credit one or more hours. (Normally reserved for seniors in upper two-fifths of class.) Prerequisites, adequate ability and training for the work proposed, and permission to register. Staff.

Special work in any area of agricultural engineering on problems under investigation by the department or of special interest to the student, provided, in the latter case, that adequate facilities can be obtained.

450. SPECIAL TOPICS IN AGRICULTURAL ENGINEERING

Spring term. Credit one hour. Open only to seniors. T 12. Riley-Robb 225. Professor French.

Presentation and discussion of the opportunities, qualifications, and responsibilities for positions of service in the various fields of agricultural engineering.

451-452. AGRICULTURAL ENGINEERING DESIGN PROJECT

Total credit six hours. Fifth year work in the form of projects.

Individual work, or in small groups, with staff guidance. Primarily intended to develop initiative and self-reliance, as well as to provide for experience with engineering design problems. Problems in the student's area of interest will be assigned after consultations between student and staff. Staff.

461. AGRICULTURAL MACHINERY DESIGN

Fall term. Credit three hours. Given in alternate years. Prerequisite, Engineering 3331 or the equivalent. Two lectures, one laboratory. Time and place to be arranged. Professor Gunkel.

The principles of design and development of agricultural machines to meet functional requirements. Emphasis is given to stress analysis, selection of materials of construction, and testing procedures involved in machine development.

[462. AGRICULTURAL POWER

Spring term. Credit three hours. Prerequisites, Engineering 3331, 3621, or the equivalent. Lectures, laboratory, and computing periods. Time and place to be arranged. Assistant Professor Siemens.] Not given in 1966-1967.

Basic theory, analysis, and testing of internal combustion engines specifically for use in farm tractors and other agricultural power applications. Tractor transmissions, Nebraska Tractor Tests, soil mechanics related to traction, stability, shop dynamometers, fuels, hydraulic equipment.

463. PROCESSING AND HANDLING SYSTEMS FOR AGRICULTURAL MATERIALS

Fall term. Credit four hours. Given in alternate years. Three lectures and one laboratory. Time and place to be arranged. Associate Professor Furry.

Processes such as size reduction, separation, metering, drying, and refrigeration will be studied. Principles of and equipment for handling agricultural materials are included. Development of processing and handling systems and their electrical controls will be emphasized. Motors and electric power facilities are also included.

471. SOIL AND WATER ENGINEERING

Spring term. Credit three hours. Given in alternate years. Prerequisites, Course 271, Engineering 2303, and Agronomy 200, or their equivalents. Three lectures, one laboratory every other week. Time and place to be arranged. Associate Professor Black.

An advanced course in the application of engineering principles to the problems of soil and water control in agriculture. Includes design and construction of drainage systems and farm ponds; and design and operation of sprinkler systems for irrigation.

[481. AGRICULTURAL STRUCTURES

Spring term. Credit three hours. Given in alternate years. Prerequisites, Engineering 2701 and 3625. Lectures, T Th 11. Laboratory, W 2-4:30. Riley-Robb 325. Assistant Professor Scott.] Not given in 1966-1967.

Synthesis of complete farmstead production units including structures, equipment, and management techniques. Integrated application of structural

theory, thermodynamics, machine design, and methods engineering to satisfy biological and economic requirements.

491. LOW-COST ROADS

Credit three hours. Primarily for applications to developing countries. Offered upon sufficient demand, usually in fall term. Prerequisite, consent of instructor. Principally directed study with one two and one-half hour class session per week to be arranged. Professor Spencer.

Study of economic considerations in road system improvement; road improvement planning and programming; road location and geometric design; engineering soil characteristics and classification; design of roadbed thickness; drainage; stabilization methods and materials; dust palliatives; wearing surfaces.

501. SIMILITUDE METHODOLOGY

Spring term. Credit three hours. Lectures, T Th 11. Riley-Robb 105. Laboratory, F 2-4:30. Riley-Robb 325. Associate Professor Furry.

Similitude Methodology, including the use of dimensional analysis to develop general equations to define physical phenomena, model theory, distorted models, and analogies. Introduction to a variety of applications in engineering. It is preferred that the student know how to program in Fortran, although knowledge of CORC is acceptable.

601. GENERAL SEMINAR

Fall and spring term. Required of graduate students. M 12:30. Riley-Robb 400.

Presentation and discussion of research and special developments in agricultural engineering. Staff.

602. TECHNICAL SEMINAR

Spring term. Credit one or two hours. Time to be arranged. Riley-Robb 205. Staff.

Thorough investigation and discussion of research in a special area of interest to those enrolled.

AGRONOMY

The Department of Agronomy offers instruction in both soils and field crops. It accepts as majors both students who are preparing for scientific professions and those who are interested primarily in applications of soil and crops subjects to practical problems. To accommodate all of these interests, the Department offers four areas of specialization as majors: (1) crops science; (2) soil science; (3) crops; and (4) soils (including soil conservation). In addition to College requirements, all of these majors require a minimum of fifteen semester hours of agronomy, an elementary course in plant physiology, and demonstrated interest in the field.

Students preparing for graduate studies or scientific careers should choose the crop science or soil science major. Both require, in addition to the general requirements listed, a minimum of two semesters of calculus and fourteen semester hours chosen from among designated advance courses in chemistry and physics. Emphasis is placed on the basic physical and biological sciences, and work in agronomy and related fields is selected to complement that training. The soil science curriculum satisfies requirements for professional certification by the Soil Science Society of America.

Students concerned primarily with applications of technical soil and crop subject matter to practical problems, should major in soils or crops. Minimum departmental requirements are those common to all agronomy majors. Cur-

ricula emphasize applied courses in agronomy and related fields, supported by those courses in basic physical and biological sciences essential for technical competence in the major.

Soil Science

200. NATURE AND PROPERTIES OF SOILS

Fall or spring term. Credit four hours. Prerequisites, Chemistry 103 or 107 or Biological Science 131. Lectures, M W F 9. Caldwell 100. Laboratory: fall term, M T W Th or F 2-4:30; spring term, M T W Th or F 2-4:30; or S 8:30-11. Caldwell 49. Fall term, primarily for two-year students: limited number of four-year students will be admitted with consent of instructor. Spring term limited to four-year students. Fall term, Professor Lathwell. Spring term, Assistant Professor Milford.

A comprehensive introduction to the field of soil science with emphasis on scientific principles and their application in solutions of practical soil management problems.

301. IDENTIFICATION, APPRAISAL, AND GEOGRAPHY OF SOILS

Spring term. Credit four hours. Prerequisite, Course 200 or permission of the instructor. Lectures, M W F 11. Laboratory, M 2-4:30. Warren 37. Associate Professor Arnold.

The soil as a natural body. Principles of identification and classification of geographic units of soil and interpretation of such units for applied objectives. Geography of major kinds of soil of North America in relation to environment and cultural patterns. Field practice in characterizing, mapping, and interpreting geographic soil units.

306. SOIL MICROBIOLOGY

Spring term. Credit three hours. Prerequisite, Course 200 or Biological Science 290. Lectures, M W F 8. Warren 31. Associate Professor Martin Alexander.

A study of the major groups of soil microorganisms, their ecological interrelationships, and the biochemical functions of the soil population.

310. AGRONOMY LITERATURE

Spring term. Credit one hour. Prerequisites, Courses 200 and 111 or their equivalents. Beginning graduate students accepted by permission of the instructor. Th 12. Warren 37. Assistant Professor Milford.

In addition to study of research and extension periodicals reporting work in agronomy, each student will review one recent scientific article and will prepare an essay on an appropriate subject in agronomy.

321. SOIL AND WATER CONSERVATION

Spring term. Credit two hours. Prerequisite, Course 200 or equivalent. Course 111 is recommended. Must be taken with Agricultural Engineering 321. Lectures, M W 9. Riley-Robb 105. Associate Professor Zwerman.

A study of the principles and practices used in soil and water conservation. Agronomic aspects of erosion control, water management and storage, drainage, and irrigation receive primary consideration.

324. SOIL FERTILITY AND FERTILIZERS

Fall term. Credit three hours. Prerequisite, Course 200 or permission of the instructor. Lectures, M W F 9. Warren 145. Associate Professor Bouldin.

An integrated discussion of soil-plant relationships with emphasis on the soil as a medium for root growth, the soil as a source of mineral nutrients

for plants, resources required for fertilizer production, and the role of fertilizers in crop production.

401. GEOGRAPHY AND APPRAISAL OF SOILS OF THE TROPICS

Spring term. Credit three hours. Lectures, W F 12. Caldwell 100. Discussion, F 2-4:30. Warren 37. Associate Professor Van Wambeke.

Character, production potential, and management requirements of soils of tropical rain forests, tropical savannahs, tropical deserts, and tropical highlands, including soils under paddy culture. Emphasis is on the identification of soil properties associated with the principal kinds of soil, bases for predicting their occurrence, and bases for their interpretation in terms of production potential and management requirements. Lectures are used to introduce principles whose applications are treated by problem-solving, discussion, and independent study of the literature. Individuals who have not had the equivalent of Course 301 will be expected to become familiar with standard nomenclature of field properties of soil by self-study.

402. CHEMICAL METHODS OF SOIL ANALYSIS

Spring term. Credit three hours. Prerequisites, Course 200 and Chemistry 236 or their equivalent. T Th 2-4:30. Caldwell 100. Professor Peech.

Lectures, laboratory exercises, and demonstrations designed to familiarize the student with different chemical techniques for studying soils.

[403. ORGANIC SOILS

Fall term. Credit two hours. Given in alternate years. Prerequisite, Course 200. Lecture, T Th 9. Warren 31. Professor Dawson.] Not given in 1966-1967.

Physical and chemical properties of organic soils used for crop production and soil conditioning. One all-day Saturday field trip.

404. FOREST SOILS

Fall term. Credit two hours. Given in alternate years. Prerequisite, Course 200. T Th 8. Professor Stone.

Ecology of forest soil including relationships to soil development, forest land use, and hydrology. Occasional field trips to be arranged.

405. SOIL MINERALOGY

Fall term. Credit three hours. Given in alternate years. Prerequisites, Course 200, and one year each of college chemistry and physics or consent of instructor. Lectures, T Th 9. Warren 260. Laboratory, W 2-4:30. Assistant Professor Milford.

A study of the minerals found in soils, their structures, properties, and weathering characteristics, and a study of some methods used in making mineralogical determinations.

408. SOIL PHYSICS, LABORATORY

Fall term. Credit one hour. S 8-10:30 or as arranged. Caldwell 291. Professor R. D. Miller.

Exercises in physical methods used in soil investigations.

450. SPECIAL TOPICS IN SOIL SCIENCE

Fall and spring terms. Credit one to six hours. The topics to be treated will be arranged at the beginning of each term for individual self-study or for group discussions. Time to be arranged. Staff.

461. REGIONAL AGRONOMY STUDIES

Fall term. Credit four hours. Prerequisites, Courses 111 and 200 or permission of the instructor. Enrollment limited and must be approved by instructor in charge. Discussion, Th 12. Caldwell 100. Three weeks field study trip preceding June. Assistant Professor Milford and staff.

Study of soils, crops, agriculture, agricultural institutions, and agricultural industries of midwestern and northern great plains regions of the United States. The purpose is to give breadth of understanding of the field of agronomy and perspective of its applications. During the summer field study trip, each student will be required to keep complete notes of basic subject matter for discussion and assignments during the fall semester. Bus transportation will be provided from Ithaca to Colorado and return. Students must finance meals and lodging, costs of which will be held to a minimum.

[501. SOIL CHEMISTRY

Fall term. Credit three hours. Given every other year. Prerequisites, Course 200 and a one-year course in introductory physical chemistry, or consent of the instructor. Lectures, T Th S 10. Warren 31. Professor Peech.] Not given in 1966-1967.

Chemical and mineralogical composition and chemical properties of soils, with emphasis on ionic equilibria in soils.

503. MORPHOLOGY, GENESIS, AND CLASSIFICATION OF SOILS

Spring term. Credit three hours. Given every other year, alternating with Course 524. Prerequisite, graduate standing or permission of the instructor. T Th S 10. Warren 37. Associate Professor Arnold.

Principles of soil classification, reactions and processes of soil genesis, and development and significance of major groups of soils of the world. One all-day field trip on a date to be arranged.

506. ADVANCED SOIL MICROBIOLOGY

Fall term. Credit one hour. Prerequisite, Course 306 or permission to register. Time and place to be arranged. Associate Professor Martin Alexander.

Discussions of current topics in special areas of soil microbiology. Particular attention is given to biochemical problems in microbial ecology.

507. SOIL PHYSICS, LECTURES

Fall term. Credit three hours. Given in alternate years. Prerequisites, Course 200 and one year of college physics or permission of the instructor. M W F 9. Warren 260. Professor R. D. Miller.

A study of physical properties and processes of soil, with emphasis on basic principles.

524. SOIL FERTILITY, ADVANCED COURSE

Spring term. Given in even-numbered years. Prerequisite, graduate status, major or minor in agronomy or permission of instructor. Lectures, T Th S 9. Warren 37. Associate Professor Bouldin.

A study of selected topics in soil-plant-fertilizer relationships with emphasis on concepts of soil fertility, interpretation of experimental data, and soil-fertilizer chemistry.

560. RESEARCH IN SOIL SCIENCE

Fall and spring terms. All members of the professional staff.

Field Crops

111. PRODUCTION OF FIELD CROPS

Fall or spring term. Credit four hours. In the fall, open to all classes beginning with first-semester freshmen until all four-year applicants have been accommodated. Two-year students will not be admitted. In the spring, two-year students will be given preference over those in the four-year course.

Graduate students must consult the instructor before registering. Auditors not permitted. Lectures, M W F 10. Caldwell 100. Laboratory: fall term, M T W or Th 2-4:30; spring term, T W Th or F 2-4:30. Caldwell 250. Assistant Professor Obendorf.

Deals principally with the crops that are used for feeding livestock and poultry. Emphasis is placed on the hay, silage, pasture, and grain crops of the United States. Cultural methods, management, crop rotations, lime and fertilizer practices, soil and climatic adaptations, and the fundamental principles of species and varietal recognition are considered. Two outdoor practicum involving study in a very extensive crop garden will be held during regular laboratory periods.

312. FEED CROPS

Spring term. Credit four hours. Prerequisite, an introductory course in crop production. A course in livestock feeding is desirable but not essential preparation. Lectures, M W F 8. Discussion, F 11 or 12. Warren 345. Associate Professor M. J. Wright.

The production of field crops with reference to their value for livestock in terms of energy, protein, and other nutritional components. Consideration will be given to establishment, management, harvesting, and preservation practices that influence yield and nutritive value. Forage grasses, forage legumes, and corn will be emphasized.

313. PHYSIOLOGICAL ECOLOGY OF CROP PLANTS

Fall term. Credit three hours. Prerequisites, Courses 200 and 111 or their equivalents. Lectures, T Th S 9. Warren 160. Professor Musgrave.

Fundamental principles of plant physiology applied to the analysis of the effects of environmental factors on temperature and light reactions, nutrient uptake, and water requirements of crop plants during growth, maturation, and dormancy.

315. WEED CONTROL

Spring term. Credit three hours. Graduate students may register only by permission. Prerequisite, Course 111. Lectures, T Th 8. Caldwell 100. Laboratory, M 2-4:30. Plant Science 114. Professor Fertig.

Principles and methods of weed control. Emphasis on principles of control by mechanical, biological, and chemical methods, their adaptability and limitations. Laboratory covers identification, habits, and control methods of weeds common in the Northeast, weed seed identification, spray equipment and its use. Field trips to be arranged.

422. TROPICAL AGRICULTURE

Spring term. Credit two to four hours, depending upon student preparation, participation, and related courses taken. Lectures and discussions, M W F 10. Plant Science 37. Prerequisites, a course covering elementary botany and permission of instructor. Professor MacDonald.

Designed to provide some knowledge and understanding of the tropical environment and its agriculture. Topics covered include the agriculture, principal crops, and cropping problems of the tropics and sub-tropics. Particular stress is given to (a) agricultural ecology, (b) agricultural patterns, traditions, and problems, (c) economic crops, their botany, adaptation, cultural requirement, improvement, management, protection, production, and use, and (d) resources, limitations and opportunities for tropical agricultural development and improvement. Independent study of the literature is encouraged and facilitated. Lectures supplemented by illustrations, demonstrations and discussions.

425. ECONOMIC CROPS OF THE WORLD, THEIR NATURE, PROPERTIES, PRODUCTS, AND USE

Spring term. Credit four hours. Prerequisite, course in field crop production and organic chemistry or biochemistry and permission of instructor. Lectures, M W F 9. Laboratory, W 2-4:30. Warren 37. Professor MacDonald.

A study of the agronomic crops of the world in relation to their occurrence, adaptation, culture, production, and use. Special attention is devoted to feed, food, fiber, oil, drug, and various other crops of arid and tropical regions. Crop processing, product extraction, and storage will be discussed. Emphasis will be on plants and plant products for the use of man.

451. SPECIAL TOPICS IN FIELD CROPS

Fall and spring terms. Credit one to six hours. The topic to be treated will be arranged at the beginning of each term for individual self-study or for group discussions. Time to be arranged. Staff.

513. CROP ECOLOGY

Fall term. Credit two hours. Given every other year, alternating with Course 514. Prerequisites, Course 200, 111, and Biological Science 240. Class meetings to be twice weekly for first eight weeks of semester for two hours per meeting. Times to be arranged. Professor Musgrave.

An extension of Course 313 and a study of special techniques used to obtain and analyze physiological data on crop plant responses to environmental conditions occurring in the field.

[514. GRASSLANDS AND GRASSLAND RESEARCH

Fall term. Credit three hours. Given in alternate years. Prerequisites, Course 312, Plant Breeding 200, and Biological Science 240, or their equivalents, and permission to register. M W F 9. Warren 245. Professor MacDonald.] Not given in 1966-1967.

A study of ecological factors underlying the development, maintenance, and management of different grassland types for different uses, and the principles and practices of grassland and forage-crop investigations. Different grassland species, types, and associations will be discussed in relation to adaptation, production, and use. Emphasis will be on research.

561. RESEARCH IN FIELD-CROP PRODUCTION

Fall, spring, and summer terms. All members of the professional staff.

Departmental Seminar

690. SEMINAR

Fall and spring terms. Required of graduate students majoring or minoring in the department. T 4:30. Caldwell 100.

ANIMAL SCIENCE

A comprehensive program of courses is available to students interested in almost any phase of animal science. In consultation with an adviser, a student may select a sequence of courses that would prepare him for (1) live-stock farming—dairy cattle, beef cattle, sheep, or swine; (2) service in extension; (3) work in meat packing or feed industries; and (4) various agricultural businesses. For those interested in careers in teaching and/or research,

the course program outlined above may be modified to include more of the basic science courses. In this manner, the student may enter the more specialized fields of animal nutrition, animal breeding, animal physiology, animal genetics, or meat processing.

Students are advised to register for Courses 100, 112, and 220 before taking the more advanced courses.

100. INTRODUCTORY ANIMAL SCIENCE

Fall term. Credit three hours. Lectures, W F 10. Morrison 146. Laboratory, T Th or F 2-4:30 or W 11-1. Livestock Pavilion. Associate Professor Elliot.

Designed to acquaint the beginning student with the development, scope, economic importance, problems, and language of the livestock industry. All commercially important classes of farm animals are considered, with emphasis on dairy cattle, beef cattle, sheep, and swine. The place of the biological sciences in a rapidly changing animal agriculture is stressed. The intent is to give insight into opportunities in the field, and to serve as an introduction to subsequent specialized courses.

241. APPLIED LIVESTOCK SELECTION: BEEF CATTLE SHEEP, AND SWINE

Fall term. Credit two hours. Prerequisite, Course 100. Lecture and laboratory period, W 1:40-4:30. Livestock Pavilion and Barns. Professor J. I. Miller.

The application of the various methods used in determining utility value of market and breeding classes of meat animals. Visual appraisal, carcass data, breeding records, and performance tests are considered.

242. LIVESTOCK JUDGING: BEEF CATTLE, SHEEP AND SWINE

Spring term. Credit two hours. Prerequisite, Course 100 or permission to register. Course 241 also recommended. Given if 12 or more students register. Students may register for only one laboratory period for one hour of credit by permission of instructor. M Th 2-4:30. Livestock Pavilion. Associate Professor Pierce.

Judging market and breeding classes of beef cattle, sheep, and swine, with major emphasis on a study of the type of breeding stock which best meets modern demands. One field trip of about two days' duration is made to give additional opportunities to study livestock in outstanding herds or flocks.

260. BEEF CATTLE

Spring term. Credit three hours. Prerequisite, Course 100 or permission to register. Lectures, T Th 10. Morrison 163. Laboratory, F 2-4:30. Livestock Pavilion and Beef Cattle Barns. Professor J. I. Miller.

A general course in beef-cattle production. The management, feeding, breeding, selection, and marketing problems involved in the beef-cattle enterprise are emphasized. A one-day field trip is taken to study successful beef production methods.

270. SWINE

Spring term. Credit three hours. Prerequisite, Course 100. Courses 112 and 220 recommended. Lectures, T Th 9. Morrison 342. Laboratory, T 2-4:30. Morrison 342 and Swine Barn. Associate Professor Pond.

A course in modern purebred and commercial swine production with emphasis on application of nutritional and genetic principles to economical production and product quality. Digestive, reproductive, and developmental physiology are stressed and disease control is included. A one-day field trip is taken.

280. SHEEP

Fall term. Credit three hours. Prerequisite, Course 100 or permission to register. Courses 112 and 220 recommended. Lectures, T Th 10. Morrison 163. Laboratory, M 2-4:30. Morrison 164 and Sheep Barn. Associate Professor Hogue.

A general course in the care, breeding, feeding, management, and selection of sheep. Lectures and laboratory periods designed to give the student a practical knowledge of sheep production as well as some scientific background for improved practices in sheep production.

343. ADVANCED LIVESTOCK JUDGING

Fall term. Credit two hours. Registration by permission. Given in alternate years. Associate Professor Pierce.

An advanced study of purebred market and breeding classes of beef cattle, sheep, and swine. Intended primarily to give additional training to successful students of Course 242. Two 2-day trips are taken on week ends. Members of this group are selected to represent the institution in intercollegiate judging competitions.

400. LIVESTOCK PRODUCTION IN THE TROPICS

Spring term. Credit three hours. Prerequisite, Course 100, 112 or 220, or permission of the instructor. Lectures and discussions, T Th 10-12:30. Morrison 342. Professors Loosli and Matthyse.

A discussion of the present and potential roles of domesticated animals as a source of food, power, and fiber in tropical areas of the world. Physiological effects of climatic and other environmental factors, breed and species characteristics involving adaptability, heat tolerance, disease resistance, and management in relation to feed utilization, will be summarized. The efficiency of production of meat, milk, wool, and eggs will be considered.

ANIMAL PHYSIOLOGY. (VETERINARY 310.)

Spring term. Credit three hours. Prerequisites, one year of biology or zoology and college courses in chemistry. Lectures and demonstrations arranged especially for students of agriculture but open to others. Professor Sellers.

HEALTH AND DISEASES OF ANIMALS. (VETERINARY 470.)

Spring term. Credit three hours. Not open to first-year students or to those who have had no course in animal husbandry. Lectures, M W F 11. Veterinary College C 207. Dr. Loomis and collaborators.

The causes and the nature of the common diseases of livestock are discussed. Emphasis is placed on the prevention and control of animal diseases.

Meats

290. MEAT AND MEAT PRODUCTS

Fall or spring term. Credit three hours. Course 100 is recommended before registering for this course. Lecture, T 8. Discussion, Th 8. Morrison 82. Laboratory, M, T or W 2-4:30. Morrison 77. Registration limited to sixteen students in each section. Professor Wellington and Associate Professor Stouffer.

Livestock slaughtering, retail meat cutting, live animals and carcass relationships, and the preservation and storage of meat and meat products. A one-day field trip to packing plants will be taken.

293. MEAT CUTTING

Fall or spring term. Credit one hour. Prerequisite, Course 290 and permission to register. Enrollment limited to five students each term. One laboratory

period each week, time to be arranged with the instructor. Morrison 91. Mr. Holley.

Supervised practice in meat selection, cutting, and merchandising for students with a special interest in meats.

394. MEAT SELECTION AND GRADING

Fall term. Credit one hour. Given in alternate years. Prerequisite, Course 290. Registration by permission. Th 2-4:30. Morrison 82. Professor Wellington.

Classification and grading of meat, judging and selection of carcasses and wholesale cuts. Field trips and practice hours are arranged at meat packing plants. Members of this class are selected to represent the institution in intercollegiate judging competitions.

[490. MEAT TECHNOLOGY

Fall term. Credit three hours. Given in alternate years. Prerequisite, Course 290 or by permission. Lecture, T 9. Morrison 82. Laboratory, T Th 2-4:30. Professor Wellington.] Not given in 1966-1967.

The basic methods of meat processing, formulations, methods of meat product testing, and meat product development through study and laboratory experience.

PHYSICAL AND CHEMICAL PROPERTIES OF MEAT, EGGS AND FISH AS RELATED TO MARKETING. (FOOD SCIENCE 225.)

Dairy Husbandry

250. DAIRY CATTLE

Fall term. Credit three hours. Lectures, T Th 8. Laboratory, M 2-4:30. Morrison 163 and Livestock Pavilion. Associate Professor Merrill.

Designed as a general course for students whose primary interest is other than dairy cattle and who do not have the prerequisites for Course 350. Students with a major interest in dairy production should take 350. (If Course 350 is taken after 250 only one hour of credit will be given for Course 350.)

Some of the economic aspects of the dairy industry; study of dairy breeds; factors in breeding and development of dairy cattle; milking methods and milk production problems; efficient feeding; and care, management, and health of the dairy herd. Practice in selection, herd management, formulating rations, planning breeding program, and record keeping.

251. DAIRY CATTLE SELECTION AND TYPE EVALUATION

Spring term. Credit three hours. Laboratory, W 2-4:30 throughout the term, S 10-12:30 during first half of term, and all day Saturday during last half of term. Livestock Pavilion. Professor Slack.

A beginning course in the selection and type evaluation of all breeds of dairy cattle. Emphasis on herd improvement through high production, and conformation characteristics for practical type to achieve wearability for high lifetime production. Educational lectures, demonstrations, and practice sessions include all-day trips to outstanding herds in the state.

350. DAIRY CATTLE PRODUCTION AND MANAGEMENT

Spring term. Credit three hours. Prerequisite, Courses 112 and 220. Lectures, T Th 11. Morrison 163. Laboratory and discussion, T 2-4:30. Morrison 164. Associate Professors Merrill and Schmidt.

Students who have an extensive interest in dairy cattle production should take Course 350 instead of 250. If 350 is taken after 250, only one hour of credit will be given for Course 350, except that students who have taken 250

prior to September 1, 1965 will receive full credit for Course 350. Analysis of dairy cattle breeding, housing, and management; study of dairy cattle breeds and breed association programs; development of feeding systems for high economical production; and study of the principles of milk secretion and milking procedures, including evaluation of milking systems. Consideration will be given to the application of modern technology in these areas. Farm visits will be made to observe this technology in operation.

352. ADVANCED DAIRY-CATTLE SELECTION

Fall term. Credit one hour. Prerequisite, Course 251. Registration by permission. Practice hours to be arranged. Professor Slack.

Intended primarily to give additional training in comparative judging to successful students of Course 251. Members of the class are selected to represent the institution in intercollegiate judging competitions.

451. PHYSIOLOGY AND BIOCHEMISTRY OF LACTATION.

Spring term. Credit three hours. Prerequisite, Courses 427 or Veterinary Physiology 310. A course in biochemistry is recommended before registering for this course. Lectures, T Th 9. Morrison 163. Laboratory, T 2-4:30. Morrison 174. Associate Professor Schmidt.

An advanced course in the anatomy of the mammary gland, the physiological mechanisms of milk secretion, and the biochemical synthesis of milk constituents in laboratory and farm animals.

Animal Breeding and Physiology

220. ANIMAL BREEDING

Fall term. Credit three hours. Prerequisite, Biological Sciences 101 and 102 or 103 and 104. Lectures, T Th 9. Morrison 146. Demonstration and laboratory, M T W Th F 2-4:30, or T 10-12:30. Morrison 174. Professor Foote.

An introduction to the anatomy and physiology of reproduction and the genetics of farm animals, and improvement of livestock through the integrated application of this knowledge. Laboratory material to give the student a first-hand knowledge of reproductive processes, and equipment are provided.

420. PROBLEMS IN GENETICS OF ANIMAL BREEDING

Fall term. Credit one, three or four hours. Prerequisite, Course 220 or Biological Sciences 281. Lectures, T Th 11. Laboratory, W or F 2-4:30. Morrison 342. Assistant Professor Van Vleck.

A consideration of the problems involved in the improvement of the larger farm animals and the application of genetics in their solution. The purpose of the optional hour is to give graduate students and qualified undergraduates an introduction to methods of research in quantitative genetics and animal breeding.

424. ANIMAL GENETICS

Spring term. Credit two hours. For veterinary students only. Lecture, T 9. Laboratory, T 2-4:30. Morrison 146. Assistant Professor Van Vleck.

Principles of genetics; sex determination and sex linkage; inherited characters in domestic animals, with special reference to lethal genes and genetic resistance to disease; progeny-testing, inbreeding and crossbreeding.

427. FUNDAMENTALS OF ENDOCRINOLOGY

Fall term. Credit three hours. Prerequisite, a course in human or veterinary physiology, or by permission. Lectures, T Th S 10. Morrison 167. Professor Hansel.

A general course in the physiology of the endocrine glands, and the roles played by each hormone in the regulation of normal body processes.

428. FUNDAMENTALS OF ENDOCRINOLOGY, LABORATORY

Fall term. Credit one hour. Registration by permission. Time to be arranged. Morrison 167. Professor Hansel.

The laboratory work consists of a series of projects designed to illustrate the basic principles of endocrinology and their applications to more efficient production in all classes of livestock.

430. LIVESTOCK IMPROVEMENT THROUGH ARTIFICIAL BREEDING
Spring term. Credit four hours. Prerequisite, Course 220 or equivalent, and consent of instructor. Lectures, T 10. Recitation to be arranged. Laboratory, T and F 2-4:30. Morrison 174 and 167. Associate Professor R. W. Bratton.

The application of principles of physiology and genetics in the breeding of farm livestock artificially so as to maximize genetic improvement of those traits of economic importance. The laboratories will provide opportunity for students to obtain experience in the techniques relevant to both the male and the female aspects of artificial insemination of large farm animals, and to study the genetic and economic problems relevant to artificial breeding.

MAMMALIAN PHYSIOLOGY. (BIOLOGICAL SCIENCES 414.)

520. EXPERIMENTAL METHODS IN QUANTITATIVE GENETICS AND ANIMAL BREEDING

Fall term. Credit three hours. Prerequisite, Plant Breeding 514 or a course in mathematical statistics. Time and place to be arranged. Professor Henderson.

Estimation of genetic and environmental parameters required to design efficient selection programs. Particular emphasis is given to interpretation of experimental and survey data with unequal subclass numbers and to prediction of genetic progress resulting from alternative selection methods.

610. SEMINAR IN ANIMAL REPRODUCTION AND ENDOCRINOLOGY
Spring term. No credit. Open to graduate students with majors or minors in animal physiology. Th 4. Morrison 312.

COMPARATIVE PHYSIOLOGY OF REPRODUCTION OF VERTEBRATES. (POULTRY SCIENCE 425.)

Animal Nutrition

112. LIVESTOCK FEEDING

Fall or spring term. Credit four hours. Prerequisite, Chemistry 103, 107, or Biological Sciences 131. Lectures: fall term, M W F 11; spring term, M W F 9. Morrison 146. Laboratory: fall term, Th or F 2-4:30; spring term, M W Th or F 2-4:30. Morrison 164. Fall term. Professor R. G. Warner; spring term, Professor S. E. Smith.

The feeding of farm animals, including the general basic principles, feeding standards, the computation of rations, and the composition and nutritive value of livestock feeds.

311. THE PRINCIPLES AND PRACTICE OF ANIMAL FEEDING

Spring term. Credit three hours. Given primarily for students in the Veterinary College. Lectures, M W 8. Morrison 163. Laboratory, T 2-4:30. Morrison 164. Associate Professor Hogue.

Consideration is given to the basic principles of animal nutrition, nutritive requirements for various body functions: the identification, composition, and

nutritive value of feeds, and the formulation of animal rations. The species covered include dairy cattle, beef cattle, sheep, swine, and horses, and there will be some consideration of dogs, cats, and other small animals.

410. PRINCIPLES OF ANIMAL NUTRITION

Fall term. Credit two hours. Prerequisites, a course in human or veterinary physiology and a course in organic chemistry or biochemistry. Lectures, T Th 10. Morrison 342. Professor Loosli.

The chemistry and physiology of nutrition and the nutritive requirements for growth, reproduction, lactation, and other body functions.

510. SPECIAL TOPICS IN ANIMAL NUTRITION

Spring term. Credit one hour. Registration by permission. Th 8. Morrison 342. Professors Reid and S. E. Smith.

A presentation and discussion of the knowledge and techniques of special fields of animal nutrition, with particular reference to farm animals.

511. LABORATORY WORK IN ANIMAL NUTRITION

Spring term. Credit three hours. Prerequisites, quantitative analysis and Course 410, or its equivalent, and permission of the instructor. M W F 2-4:30. Morrison 342 and 443. Professor Warner.

Each student engages in a series of short research projects with experimental animals, such as rats, dogs, and sheep. Both classical and modern techniques of animal experimentation are taught. The applications of biochemical methods to the solution of animal nutrition problems are included.

619. SEMINAR IN ANIMAL NUTRITION

Fall term. Credit one hour. Open to graduate students with major or minor field of study in animal nutrition. Registration by permission. T 4:30. Morrison 348. Animal Nutrition staff.

A critical review of the literature and other topics of special interest to graduate students in animal nutrition.

Advanced Nutrition

A series of nutrition courses offered jointly by the Department of Food and Nutrition, College of Home Economics; Department of Animal Science, College of Agriculture; Department of Poultry Science, College of Agriculture; and the Graduate School of Nutrition.

Prerequisites: courses in nutrition, physiology and biochemistry to include intermediary metabolism, or with permission of instructor.

The biochemical and physiological bases of digestion, absorption, transport and metabolism of nutrients; species differences where applicable; historical as well as current concepts of nutrition.

PROTEINS AND AMINO ACIDS. (FOOD AND NUTRITION 501.)

Fall term. Credit two hours. M W 10. Martha Van Rensselaer 339. Associate Professor M. A. Morrison.

502. LIPIDS AND CARBOHYDRATES

Fall term. Credit two hours. T 11 and F 10. Martha Van Rensselaer 339. Professor R. J. Young.

503. NUTRITIONAL ENERGETICS

Spring term. Credit two hours. M W 10. Morrison 342. Professor Reid.

504. MINERALS AND VITAMINS

Spring term. Credit two hours. T 11 and F 10. Morrison 342. Professor M. L. Scott.

Departmental Research and Seminars

395. UNDERGRADUATE RESEARCH

Fall and spring terms. Credit one to three hours, depending upon the problem undertaken and extent and quality of work done. Before registering for this course the student must obtain the written permission of a professor who will supervise the work. Open only to seniors of high scholastic ability with grade averages of 80 or above.

Designed to afford opportunities for outstanding undergraduates who plan to go to graduate school to carry out independent studies of suitable research problems under appropriate supervision. Each student will be expected to make a review of the literature, prepare a project outline, conduct the research, and write a summary report.

401. UNDERGRADUATE SEMINAR

Fall and spring terms. Credit one hour. Limited to advanced undergraduates interested in animal husbandry. Hour to be arranged. Morrison 348. Staff.

A study of the pertinent literature of special topics in animal husbandry. Students will be required to review current literature and to present oral and written reports.

500. RESEARCH

Fall and spring terms. Credit and hours by arrangement. All members of departmental staff.

601. SEMINAR

Fall and spring terms. Credit one hour. Required of all graduate students taking either a major or a minor subject in animal science. M 11. Morrison 348. Staff.

BIOLOGICAL SCIENCES

Students will be provisionally accepted in the biological sciences specialization as established by the Division of Biological Sciences during their freshman year or the first term of the sophomore year. Final admission to the specialization will require completion of (1) a year of biology (Biological Sciences 101-102 or 103-104); (2) a year of general chemistry (preferably Chemistry 107-108); and (3) a year of calculus (Mathematics 111-112 or 111-122). Whenever possible, the student should include the above three subjects in his freshman schedule and complete organic chemistry and genetics in the sophomore year. It is also advisable for students anticipating a concentration in biochemistry or physiology to complete Physics 207-208 in the sophomore year, and all students should consider doing so. A student is not encouraged to undertake a specialization in biological sciences unless his performance in the above courses gives evidence of capacity to do satisfactory work at a more advanced level.

In addition to the introductory courses in chemistry, biological sciences, and mathematics, each specializing student must complete the following: (1) Chemistry 353-355 (or 357-358); (2) a year of physics (preferably Physics 207-208, but 101-102 is also accepted); (3) Biological Sciences 281; (4) Biological Sciences 431 (or 531); (5) the breadth requirement outlined below; (6) one of the concentration areas outlined below; and (7) a minimum of six hours of French, German, or Russian (other languages may be substituted only with special permission). The practice requirement is 13 units of appropriate experience of a professional nature.

The breadth requirement is designed to insure that each specializing student becomes familiar with a minimum number of different aspects of modern biology. In fulfillment of this requirement, each student must pass one approved course in two of the following eight categories: (1) behavior, (2) developmental biology, (3) ecology and evolution, (4) microbiology, (5) morphology, (6) physical science and mathematics, (7) physiology, (8) taxon-oriented courses.

The concentration requirement is designed to help the student achieve depth in some area of biology of his own choosing. It permits maximum flexibility, while insuring that the selection of advanced courses will form a coherent and meaningful unit. The student should seek the advice of his adviser in selecting the courses he will take in fulfillment of both the breadth and concentration requirements. The possible concentration areas are: (1) animal physiology and anatomy, (2) behavior, (3) biochemistry, (4) botany, (5) ecology and evolution, (6) genetics and development, (7) microbiology. In addition, students who, because of special reasons, wish to undertake a course of studies not covered by these concentration areas may petition for permission to do so.

Lists of courses approved for the breadth and concentration requirements and additional information concerning the specialization may be obtained in Room 201 Roberts Hall.

Students interested in teaching biology in secondary schools may specialize in Biological Sciences for the B.S. degree and then complete the requirements for the M.A.T. (Master of Arts in Teaching) degree during a fifth year in the School of Education. The fifth year includes one semester of graduate study in the sciences, a summer of preparation for teaching, and one semester of internship in a secondary school. Stipends and fellowship support are available to selected candidates in the fifth year. Students interested in the five-year program leading to secondary school teaching are urged to consult their adviser and an adviser in the School of Education during their freshman year.

General Courses

101-102. GENERAL BIOLOGY

Fall and spring terms. Credit three hours a term. Course 101 with a grade of 50 or higher is prerequisite to Course 102, unless special permission is obtained from the instructor. Lectures, M W F 8, Ives 120; or M W F 10, Warren 231; or M W F 11, Plant Science 233. Laboratory, M T W Th or F 1:40-4:30, or Th F or S 8-10:50, or T Th or F 10-12:50, or S 9-11:50, or T W 7-9:50 P.M. Roberts 392 or 304. Neither the Friday lecture nor the laboratory will meet every week. Two preliminary examinations will be given each term at 7:30 in the evening. Associate Professor Keeton, Assistant Professor Hall, instructors, guest lecturers, and assistants.

Designed to acquaint students majoring within or outside the biological sciences with the established principles of biology, and with the body of research and the methods that led to the formulation of these principles. The work is not divided in the more traditional way into a unit on animals and a unit on plants, nor is it based on a phylum-by-phylum survey; instead, attention is focused on a series of topics central to modern biology, and these are explored in some depth. More specifically, the topics include the organization, integration, and maintenance of living organisms as energy systems, and their reproduction, heredity, behavior, and interactions. Emphasis is placed on an understanding of each topic in the light of modern evolutionary theory.

The Friday lectures, given approximately every other week, will be by outstanding faculty members of the University, lecturing on their own field of research. The intent is to acquaint students with the excitement and promise of modern biological research, both basic and applied, and, more particularly, with the research being done at Cornell.

103-104. PLANT AND ANIMAL BIOLOGY

Fall and spring terms. Credit three hours a term. Limited to 500 students. Lectures, T Th 9 or 11. Fall term, Plant Science 233; spring term, Stimson G 25. Laboratory, M T W Th or F 1:40-4:30, or M or T 10-12:50, or S 8-10:50 or 9-11:50. Fall term, Plant Science 240, 242, 262. Spring term, Stimson 102, 104, 107, 116. Fall term, Professor Banks; spring term, Professor Leonard.

Designed to give students an understanding of the growth, development and evolution of plants and animals and their role in nature. This integrated course provides the basic knowledge necessary for those who intend to specialize in some aspect of plant or animal sciences.

Plant biology emphasizes the dynamic aspects of cell behavior, structure, function, evolution, and genetics in major plant groups.

Animal biology deals with the functional aspects of organ systems of animals beginning with the more familiar forms which serve as a point of reference. Material will include an introduction to the biochemical features of metabolism and regulatory control. Representatives of the major phyla will be used to illustrate biological principles.

301. LABORATORY METHODS IN BIOLOGY

Fall term. Credit three hours. Prerequisites, Biological Sciences 101-102 or 103-104. Limited to juniors, seniors, and graduate students; 20 students per section. Lecture-laboratory, T or F 10-12:30. Additional periods by appointment. Roberts 302.

For students who intend to teach or to follow some phase of biology as a profession. Subjects covered: collection, preservation, and storage of materials; the preparation of bird and mammal study skins; injection of circulatory systems with latex; clearing and staining of small vertebrates; and the preparation and staining of smears, whole mounts, and sections.

MATHEMATICAL AND STATISTICAL MODELS IN BIOLOGY. (PLANT BREEDING 410.)

400. RESEARCH IN BIOLOGY

Fall or spring term. Credit and hours to be arranged. Prerequisite, permission from the professor under whom the work is to be taken. Staff.

Practice in planning, conducting, and reporting independent laboratory and/or library research programs.

401. TEACHING BIOLOGY

Fall or spring term. Credit three or four hours. Prerequisite, permission to register; enrollment limited. Hours to be arranged. Staff.

Discussions of recent developments in the teaching of biology, and participation in teaching elementary biology at the college level.

600. SPECIAL TOPICS IN BIOLOGY

Fall or spring term. Credit and hours to be arranged. Enrollment limited to students in the Ford Three-Year Scholar's Program. Assistant Professor Hall.

Discussion of topics of special biological interest and seminars by outstanding faculty members from various departments at Cornell and other institutions. Designed to acquaint students with the excitement and promise of modern biological research.

[602. SEMINAR FOR M.S.T. DEGREE CANDIDATES

Spring term. Credit one hour. Hours to be arranged. Professor Uhler.] Not given in 1966-1967.

Discussion and evaluation of new approaches to biological instruction.

Animal Physiology and Anatomy

210. HUMAN PHYSIOLOGY

Spring term. Credit three hours. Prerequisites, Chemistry 103 or equivalent and Biological Sciences 104 or 101-102 or equivalent are desirable; students must at least have taken high school courses in biology and chemistry. Lectures, M W F 10. Place to be announced. Professor Lutwak and Associate Professor McFarland.

Basic concepts of human anatomy and physiology will be presented to provide the groundwork for the understanding of the functioning of the human body in health and disease. Emphasis will be placed on the relationship of human physiology to problems of public health and contemporary living. The individual systems, such as cardiovascular, gastrointestinal, neurological, endocrine, renal, etc., will be discussed singly and in correlation with each other. Guest lecturers will be invited as appropriate.

311. COMPARATIVE ANATOMY OF VERTEBRATES

Fall term. Credit four hours. Prerequisites, Biological Sciences 101-102, or 103-104. Lectures, M W 8 or 9. Stimson G25. Laboratory, M F or T Th 2-4:30, or T Th 8-10:30, or W F 9-11:30, or W 2-4:30 or S 8-10:30. Stimson 310. Professor Gilbert.

Dissections and demonstrations of representative vertebrate types, including fish, amphibian, reptile, bird, and mammal. Intended to give students an appreciation of man's structural heritage and some insight into the interrelationship of form and function among the vertebrates.

313. HISTOLOGY: THE BIOLOGY OF THE TISSUES

Fall term. Credit four hours. Prerequisites, a two-semester introductory biology sequence; comparative anatomy and organic chemistry or biochemistry desirable. Lectures, T Th 11. Stimson G1. Laboratory, T Th 8-10:30 or 2-4:30. Stimson 206. Professor Wimsatt.

A general course dealing with the biology of the tissues to provide the student with a basis for understanding the microscopic and fine structural organization of vertebrates and the methods of analytic morphology at the cell and tissue levels. The dynamic interrelations of structure, chemical composition and function in cells and tissues are stressed.

INSECT MORPHOLOGY AND HISTOLOGY. (ENTOMOLOGY 322.)

[410. PROBLEMS IN FUNCTIONAL VERTEBRATE ANATOMY

Spring term. Credit four hours. Given in alternate years. Prerequisites, Biological Sciences 311 and consent of instructor. Lecture, W 9. Discussion period to be arranged. Laboratory, W F 2-5. Stimson 310. Professor Gilbert.] Not given in 1966-1967.

This course is intended for a limited number of advanced students who have done exceptionally well in Biological Sciences 311. It is an advanced course, involving dissections and experiments, with emphasis on the structural and functional adaptations of representative vertebrates to their environment. As a supplement to regular laboratory exercises, each student will be expected to select a project and prepare a substantial term report on his work.

VERTEBRATE MORPHOLOGY. (VETERINARY MEDICINE 900.)

412. SPECIAL HISTOLOGY: THE BIOLOGY OF THE ORGANS

Spring term. Credit four hours. Given in alternate years. Prerequisites, Biological Sciences 313, or consent of instructor. Enrollment limited to 18 students. Lectures, W F 9. Stimson 105. Laboratory, W F 2-4:30. Stimson 206. Professor Wimsatt.

A continuation of Biological Sciences 313. The microscopic and ultra-structural organization of the principal vertebrate organ systems are studied in relation to their development, functional interaction and special physiological roles. Biological Sciences 313 and 412 together present the fundamental aspects of the microscopic and submicroscopic organization of the vertebrate body from a physiological perspective. The organization of the course involves student participation in "lecture-seminars," and the prosecution of independent project work supplementary to the regular work of the laboratory. The latter enables students to gain practical experience with histological and histochemical preparative techniques.

413. GENERAL ANIMAL PHYSIOLOGY, LECTURES

Fall term. Credit three hours. Prerequisites, one year of biology and courses in chemistry; organic chemistry and biochemistry desirable. Lectures, M W F 10. Stimson G25. Associate Professor McFarland.

The principles of animal physiology are developed through consideration of the functioning of cells, tissues and organs. Specific topics discussed include respiration, metabolism, circulation, excretion, chemical integration, muscle contraction, nerve action and sensory reception.

413A. GENERAL ANIMAL PHYSIOLOGY, LABORATORY

Fall term. Credit one hour. Prerequisites, Biological Sciences 413 or equivalent must be taken concurrently. Lecture, W 2, alternate weeks only. Stimson G25. Laboratory, T 8-11 or M T or F 1:40-4:30, alternate weeks. Stimson 306. Associate Professor McFarland.

Students are introduced to basic techniques utilized in the study of the physiology of animal tissues. Experiments cover topics dealing with respiration, properties of muscle, circulation, activity of nerves and osmotic phenomena.

FUNDAMENTALS OF ENDOCRINOLOGY. (ANIMAL HUSBANDRY 427-428.)

COMPARATIVE PHYSIOLOGY OF REPRODUCTION OF VERTEBATES. (POULTRY HUSBANDRY 425.)

414. MAMMALIAN PHYSIOLOGY

Spring term. Credit six hours. Registration by permission. Prerequisite, a year of biological sciences. Courses in biochemistry, histology, and gross anatomy desirable. Lectures, M W F 8. Morrison 167. Laboratory, M W 1-6. Morrison 174. Professors Hansel, Gasteiger, and Visek (in charge), and Assistant Professor Reeves.

A general course in mammalian physiology including circulation, respiration, digestion, metabolism, renal function, endocrinology, and the nervous system.

419. RESEARCH IN ANIMAL PHYSIOLOGY AND ANATOMY

Fall or spring term. Credit and hours to be arranged. Prerequisite, permission of the professor under whom the work is to be taken. Staff.

Practice in planning, conducting, and reporting independent laboratory and/or library research programs.

511. CELLULAR PHYSIOLOGY, LECTURES

Fall term. Credit three hours. Prerequisites, previous courses in animal or plant physiology and biochemistry desirable. Lectures, M W 11. Stimson G1. Assistant Professor Reeves.

An introduction to basic aspects of animal cell function including structural and functional organization of cells, permeability and active transport, transcellular secretion, ionic mechanisms underlying excitability phenomena in neurons and receptor cells, contractility, and bioluminescence.

511A. CELLULAR PHYSIOLOGY, LABORATORY

Fall term. Credit two hours. Prerequisite, consent of the instructor. Enrollment is limited. Laboratory, W or Th 1:40-4:30. Stimson 306. Assistant Professor Reeves and assistant.

The laboratory emphasizes a number of biophysical approaches to cellular activities.

[512. COMPARATIVE PHYSIOLOGY

Spring term. Credit four hours. Prerequisites, Biological Sciences 413 or 414 and biochemistry or the equivalent.] Not given in 1966-67.

A comparison of the principal physiological functions of vertebrates and invertebrates, with emphasis on their adaptations to different environmental conditions.

513. EXPERIMENTAL ENDOCRINOLOGY

Fall term. Credit two or three hours. Prerequisites, a year of zoology or its equivalent, organic chemistry, physiology and consent of instructor. Primarily for graduate students, open to undergraduates for two credits. Lectures, M F 11. Stimson G1. Laboratory, M or F 2-4:30. Stimson 306. Professor Leonard.

Lectures on the anatomy and physiology of the vertebrate endocrine glands, glandular interrelationships, mechanisms of hormone action, chemical and physiological properties of the hormones, assay methods. Laboratory includes small animal surgery, micro technique for the endocrines, illustrative experiments on the effects of hormones.

516. SPECIAL TOPICS IN COMPARATIVE PHYSIOLOGY

Spring term. Credit four hours. Prerequisite, consent of instructor. Enrollment limited. For advanced students in biological sciences. Lecture, Th 1:40-4:30. Associate Professor McFarland.

Detailed consideration of selected topics in comparative physiology. Preparation of demonstration experiments stressing technique and individual research problems will be included. Topics will vary from year to year.

Behavior

421. COMPARATIVE VERTEBRATE ETHOLOGY

Fall term. Credit three hours. Prerequisites, Biological Sciences 101-102 or 103-104 and permission of the instructor. Lectures, T Th 9. Rice 300. Laboratory, to be arranged. Associate Professor Dilger.

A survey of the methods and principles of vertebrate ethology for students specializing in this field or for those in other branches of zoology wishing to broaden their knowledge of animal behavior. Emphasis is placed on the causation, function, biological significance, and evolution of species-typical behavior. The laboratories are designed to give first-hand knowledge of the material covered in lectures.

PHYSIOLOGICAL PSYCHOLOGY. (PSYCHOLOGY 323.)

COMPARATIVE PSYCHOLOGY. (PSYCHOLOGY 326.)

425. RESEARCH IN ANIMAL BEHAVIOR

Fall or spring term. Credit and hours to be arranged. Prerequisite, permission from the professor under whom the work is to be taken. Staff.

Practice in planning, conducting, and reporting independent laboratory and/or library research programs.

520. COMPARATIVE NEUROLOGY

Spring term. Credit four hours. Prerequisite, permission of instructor. Lecture, T Th 12. Laboratory, M or W 2-4:30.

A comparative study of the vertebrate nervous system with emphasis upon the primate. Studies include dissections of the brain and the identification of nuclei and tracts in sections of the brain and spinal cord. Functional aspects of anatomical relations are stressed.

521-522. BRAIN MECHANISMS AND MODELS

Fall and spring terms. Credit four hours a term. Prerequisites, one year of calculus and one year of biological sciences or psychology and permission of instructor. Lectures and laboratories to be arranged. Mr. Rosenblatt.

Fall semester: Review of fundamentals of neurophysiology, psychological and physiological criteria for brain models, computers, and digital automata in relation to brain mechanisms, review of representative models, theory of elementary perceptrons. The Mark I perceptron will be available for laboratory work.

Spring semester: Theory of multi-layer and cross-coupled perceptrons; recognition of temporal patterns; problems of figure organization, cognitive sets, sequential programs, and other problems of advanced models.

FUNCTIONAL ORGANIZATION OF THE NERVOUS SYSTEM. (VETERINARY MEDICINE 924.)

620. SEMINAR IN NEUROBIOLOGY AND BEHAVIOR

Fall or spring term. Credit one hour. Time to be arranged. Staff.

Biochemistry

131. INTRODUCTORY AGRICULTURAL CHEMISTRY

Fall term. Credit five hours. Open only to two-year students in the College of Agriculture. Lecture and recitation, M T W Th F 11. Morrison 163. Associate Professor Neal.

Lectures, demonstrations, and recitations dealing with selected fundamental principles of inorganic, organic, and biological chemistry. This course is not accepted as a prerequisite for further courses in chemistry or biochemistry.

231. INTRODUCTORY BIOCHEMISTRY

Fall term. Credit three hours. Prerequisite, Chemistry 104 or 108, or the equivalent. May not be taken for credit by students who have completed a more advanced course in this section. Lectures, T Th F 12. Morrison 163. Professor Williams.

A brief survey of organic chemistry as related to biological compounds and a discussion of selected biochemical reactions associated with the metabolism of animals, plants, and microorganisms. Especially designed as a general course for four-year students in Agriculture.

431. PRINCIPLES OF BIOCHEMISTRY, LECTURES

Fall term. Credit four hours. Prerequisite, Organic Chemistry 353-355 or the equivalent. Lectures, M 8, Morrison 146; T Th S 8, Plant Science 233. Professor Daniel.

A basic course dealing with the chemistry of biological substances and their transformations in living organisms.

433. PRINCIPLES OF BIOCHEMISTRY, LABORATORY

Fall term. Credit three hours. Prerequisite, quantitative analysis, or permission of the instructor. Must be taken with or following Course 431. Laboratory, F 2-4:30 and S 9-11:30. Wing 106. One discussion period to be arranged. Preliminary examinations will be held twice during the semester at 7:30 p.m. Associate Professor Neal and assistants.

Laboratory practice with biochemical substances and experiments designed to illustrate reactions which may occur in biological systems.

439. SPECIAL PROBLEMS IN BIOCHEMISTRY

Fall or spring term. Credit hours to be arranged. For undergraduate students concentrating in biochemistry. Prerequisite, adequate ability and training for the work proposed. Staff.

Special work in any branch of biochemistry on problems under investigation by the staff of the section.

[530. BIOCHEMISTRY OF THE VITAMINS

Spring term. Credit two hours. Given in alternative years. Prerequisites, Chemistry 353-355 and Biological Sciences 431 or their equivalent. Lecture, T Th 10. Savage 100. Professor Daniel.] Not given in 1966-1967.

The chemical, physiological and biochemical aspects of the vitamins.

531. GENERAL BIOCHEMISTRY, LECTURES

Fall term. Credit four hours. Prerequisites, quantitative analysis, organic chemistry 358 or the equivalent, or permission of the instructor. Lectures, M W F S 9. Savage 100. Assistant Professor Calvo.

An integrated treatment of the fundamentals of biochemistry.

533. GENERAL BIOCHEMISTRY, LABORATORY

Fall term. Credit three hours. Prerequisite, quantitative analysis, or permission of the instructor. Must be taken with or following course 531. Laboratory, M W or T Th 2-4:30. Wing 107. One discussion period to be arranged. Preliminary examinations will be held twice during the semester at 7:30 p.m. Professor Nelson, Staff, and assistants.

Selected experiments on carbohydrates, lipids, proteins, amino acids, nucleic acids and metabolism (cellular particulates, kinetics, general enzymology) will be given to illustrate basic biochemical principles. The course will emphasize the quantitative aspects rather than qualitative identifications.

534. ADVANCED GENERAL BIOCHEMISTRY, LECTURES

Spring term. Credit four hours. Prerequisites, Biological Sciences 531 and Physical Chemistry 390 or permission of instructor. Lectures, M W F S 9. Savage 100. Staff.

A broad treatment of biochemistry at an advanced level.

536. ADVANCED BIOCHEMISTRY, LABORATORY

Spring term. Credit three hours. Prerequisites, Biological Sciences 533 or the equivalent, and Biological Sciences 534 (may be taken concurrently). Registration by permission of instructor before November 1. Laboratory, M W 1:40-4:30; additional periods to be arranged. Wing 106. Staff.

Research techniques in biochemistry and molecular biology.

537-538. ADVANCED BIOCHEMISTRY, LECTURES

Fall and spring terms. Credit one or two hours per term. Students may take one or more sections of the course for one to four hours credit, as each section may be taken without having taken a preceding section. Prerequisite, Biological Sciences 534. Lecture, T Th 9. Savage 100. This course will be comprised of advanced lectures divided into four sections of one hour credit each. Fall term: Associate Professor Gaylor, carbohydrates and lipids, one hour; Professor Hess, proteins and enzymes, one hour. Spring term: Assistant Professor Calvo, nucleic acids and control mechanisms, one hour; Associate Professor Thompson, plant biochemistry, one hour.

631. GRADUATE SEMINAR IN BIOCHEMISTRY

Fall and spring term. Credit one hour per term. Hours to be arranged. Savage 100. Staff.

Required of all graduate students majoring in biochemistry. The course may be repeated for credit.

639. BIOCHEMISTRY SEMINAR

Fall and spring terms. No credit. F 4:15. Savage 100. Staff.

Lectures on current research in biochemistry presented by distinguished visitors and staff.

Botany

240. PLANT PHYSIOLOGY

Fall or spring term. Credit four hours. Intended primarily for undergraduates, but open to graduates who lack background in plant physiology. Prerequisites, Biological Sciences 101-102 or 103-104 and introductory chemistry. Lectures, T Th 10. Plant Science 143. Laboratory, T Th or W F 2-4:30, or M 2-4:30 and S 9-11:30. Plant Science 227. Staff.

Designed to acquaint the student with the general principles of plant physiology. Topics such as water relations, photosynthesis, translocation, respiration, mineral nutrition, growth, and reproduction are studied in detail. Particular emphasis is placed, both in laboratory and classroom, on the discussion of principles and their application to plants. This introductory course in plant physiology is intended to give students a first appreciation of modern aspects of the subject and to serve as the basis for more advanced study.

341. TAXONOMY OF VASCULAR PLANTS

Fall term. Credit four hours. Prerequisite, a course in botany. Lectures and discussions, T Th 9. Plant Science 143. Laboratory, T Th 2-4:30. Mann 464. Professor Clausen.

An introduction to the classification of vascular plants, with attention to principles, methods of identification, and literature. In the first part of the term, trips are held in laboratory periods.

343. BIOLOGY OF THE ALGAE

Fall term. Credit three hours. Prerequisite, Biological Sciences 101-102 or 103-104 or permission of the instructor. Lectures, M W 11. Laboratory, M or F 2-4:30. Plant Science 202. Associate Professor Kingsbury.

Structure, ecology, physiology, relationships, evolution, and economic uses are presented as appropriate to a detailed understanding of the bluegreen, green, yellowgreen, golden brown, and euglenoid algae. Living material of a large number of genera is provided in laboratory to illustrate

lecture topics, to demonstrate characteristics of algae of potential value in research on general biological problems, to provide practice in techniques of isolation and culture, and to develop a working familiarity with the local algal flora. Biologically important characteristics of ponds and streams are brought out in relation to the algae populating them.

344. BIOLOGY OF THE ALGAE

Spring term. Credit three hours. Prerequisite, Biological Sciences 101-102 or 103-104 or permission of the instructor. Lectures, T Th 11. Laboratory, M or F 2-4:30. Plant Science 202. Associate Professor Kingsbury.

A continuation of 343, covering the diatoms, dinoflagellates, brown, and red algae and emphasizing the characteristics of the marine environment. Need not be preceded by Course 343.

COMPARATIVE MORPHOLOGY OF FUNGI. (PLANT PATHOLOGY 309.)

345. PLANT ANATOMY

Fall term. Credit four hours. Prerequisites, Biological Sciences 101-102 or 103-104 and preregistration with instructor in charge. Lectures, T Th 8. Warren 145. Laboratory, T Th 10-12:30 or M W 2-4:30. Plant Science 211. Associate Professor Bierhorst.

A detailed study of plant histology with equal emphasis on developmental aspects and mature structure.

347. CYTOLOGY

Fall term. Credit four hours. Prerequisite, Biological Sciences 101-102 or 103-104 or the equivalent. Lectures M W 9. Plant Science 143. Laboratory, M W or T Th 10-12:30. Plant Science 219. Associate Professor Uhl.

The principal topics considered are protoplasm, cells and their components, nuclear and cell division, meiosis and fertilization, and the relation of these to the problems of development, reproduction, taxonomy, and heredity. Both plant and animal materials are used.

348. MICROTECHNIQUE

Spring term. Credit two hours. Prerequisites, Biological Sciences 101-102 or 103-104 and permission to register. Hours to be arranged. Associate Professor Uhl.

A laboratory course in methods of preparing plant material for microscopical study.

349. PLANTS AND MAN

Fall term. Credit two hours. Prerequisite, Biological Sciences 101-102 or 103-104 or the equivalent. Lectures, M W 9. Warren 245. Assistant Professor Bates.

A consideration of the role of plants in the human environment and in the evolution of human culture with emphasis on the utilization of plants in nutrition, housing, clothing, medical care, industry, and the arts.

440. CYTOGENETICS

Spring term. Credit three hours. Prerequisites, Biological Sciences 347 and 281 or the equivalent. Lectures, M W 9. Plant Science 143. Laboratory, M or W 10-12:30. Plant Science 219. Associate Professor Uhl.

An advanced course dealing mainly with the cellular mechanisms of heredity and including recent researches in cytology, cytogenetics, and cytotaxonomy.

442. TAXONOMY AND ECOLOGY OF VASCULAR PLANTS

Spring term. Credit four hours. Prerequisite, Biological Sciences 341. Lectures

and discussions, T Th 9. Plant Science 143. Laboratory, T Th 2-4:30. Mann 464. Professor Clausen.

A study of the principles of classification, the fundamentals of geographical distribution, and the evolutionary importance of environmental variation. Laboratory periods in the second half of the term are devoted to study of natural populations in the field.

[444. MORPHOLOGY OF LOWER VASCULAR PLANTS

Spring term. Credit four hours. Given in alternate years. Prerequisites, Biological Sciences 345 and preregistration with instructor in charge. Lectures, M W 12. Plant Science 141. Laboratory, M W 2-4:30. Plant Science 211. Associate Professor Bierhorst.] Not given in 1966-1967.

An advanced course in the comparative morphology, life histories, and phylogeny of the non-seed bearing vascular plants, including consideration of structure, development and morphogenesis as applied to morphological interpretation.

446. MORPHOLOGY OF HIGHER VASCULAR PLANTS

Spring term. Credit four hours. Given in alternate years. Prerequisites, Biological Sciences 345 and preregistration with instructor in charge. Lectures, M W 12. Plant Science 141. Laboratory, M W 2-4:30. Plant Science 211. Associate Professor Bierhorst.

An advanced course in the comparative morphology, life histories, and phylogeny of the seed plants, including consideration of structure, development and morphogenesis as applied to morphological interpretation.

[448. PALEOBOTANY

Spring term. Professor Banks.] Not given in 1966-1967.

449. RESEARCH IN BOTANY

Fall or spring term. Credit and hours to be arranged. Staff.

Students engaged in special problems or making special studies may register in this course. They must satisfy the instructor under whom the work is taken that their preparation warrants their choice of problem.

541-542. PLANT PHYSIOLOGY, ADVANCED LECTURE COURSES

Fall and spring terms. Credit three hours a term. Primarily for graduate students, but undergraduates will be admitted by prior approval of instructor. Prerequisite, Biological Sciences 240 or its equivalent; Biological Sciences 541 is a desirable but not a required prerequisite for 542. Lectures, M W F 10. Plant Science 143. Professor Steward.

Fall term: Cells and cell physiology; properties of protoplasm, its membranes and organelles; relations of cells, tissues, and organs to water and solutes; water relations and stomatal behavior; inorganic plant nutrition; the essential nutrient elements.

Spring term: Plant metabolism and organic nutrition (photosynthesis, respiration, nitrogen metabolism); translocation; physiology of growth and development.

543-544. PLANT PHYSIOLOGY, ADVANCED LABORATORY

Fall and spring terms. Credit four hours a term. Primarily for graduate students, but undergraduates may be admitted by prior approval of the instructor. Prerequisites, Biological Sciences 240 or equivalent, and Biological Sciences 541-542 (may be taken concurrently). Laboratory, M W or T Th 1:40-5:00. Plant Science 241. Recitation, F 2-3. Plant Science 143. Preregistration strongly recommended. Staff.

The first term is concerned with modern methods. The second term is concerned with their application to special problems in plant physiology.

PLANT ECOLOGY. (COURSE 563.)

ADVANCED MYCOLOGY. (PLANT PATHOLOGY 549 AND 599.)

641. SEMINAR IN TAXONOMY AND ECOLOGY OF VASCULAR PLANTS
Fall term. Credit one hour. Prerequisite, Biological Sciences 442. Lecture and discussion, M 12. Plant Science 143. Professor Clausen.

An examination of primary problems concerned with the classification and environmental relationships of vascular plants.

643. SEMINAR IN PLANT PHYSIOLOGY

Fall and spring terms. Credit one hour per term. Required of graduate students taking work in plant physiology and open to all who are interested. F 11. Plant Science Seminar Room. Staff.

Discussion of current problems in plant physiology; presentation of reports on the research of graduate students and members of the staff. The course may be repeated for credit.

CURRENT TOPICS IN MYCOLOGY. (PLANT PATHOLOGY 649.)

Ecology, Evolution, and Systematics

270. BIOLOGY OF THE VERTEBRATES

Spring term. Credit four hours. Prerequisite, Biological Sciences 101-102 or 103-104. Lectures, M W 10. Savage 100. Laboratory, M W or T Th 2-4:30. Fernow 14. Associate Professor Layne.

An introduction to the evolution, systematics, distribution, life-history and ecology, and behavior of vertebrate animals. Laboratory and field work deal with structure, classification, taxonomic methods, and the ecology, behavior and life histories of local species. Special laboratory and field exercises are devoted to selected aspects of vertebrate life.

INSECT BIOLOGY. (ENTOMOLOGY 212.)

AQUATIC ENTOMOLOGY AND LIMNOLOGY. (ENTOMOLOGY 271.)

PLANT TAXONOMY (COURSES 341, 442, 641.)

361. GENERAL ECOLOGY

Fall or spring term. Credit three hours. Prerequisite, Biological Sciences 101-102 or 103-104 or the equivalent. Lectures, T Th 9. Fall term, Comstock 245; spring term, Caldwell 100. Discussion, W or Th 2, 3, or 4. Comstock 145. Professor Pimentel and Assistant Professor Root.

Principles governing the survival of plants and animals in their natural environment are discussed. Population dynamics are studied with attention given to competition, social behavior, predation, parasitism, and other biotic interactions. Consideration is given to the flow of energy and minerals through living systems and to the influence of climate on the abundance and distribution of organisms. The role of species diversity, dispersal, and succession are focused on with regard to natural communities. The organization of species populations and communities is interpreted in the light of modern evolutionary theories.

362. LABORATORY AND FIELD ECOLOGY

Fall or spring term. Credit two hours. Prerequisite, permission of instructor. Laboratory, T Th 2-4:30. Stimson 225. Professor Cole and others.

A laboratory and field course to accompany or follow Biological Sciences 361, for students who intend to concentrate in the area of ecology. Enrollment limited. This course will give the students a first-hand contact with ecological techniques.

SOIL MICROBIOLOGY. (AGRONOMY 306).**371. INVERTEBRATE ZOOLOGY**

Fall term. Credit four hours. Prerequisite, at least one year of biological science or permission of instructor. One or two lectures and two laboratories per week; time and place to be arranged. Professor Anderson.

Lectures on selected topics in the development, structure, function, and interrelations of invertebrate animals, with particular attention to phylogenetic aspects. Intensive laboratory work in representative invertebrates, utilizing living or fresh specimens wherever possible. A significant amount of independent work is required of each student, including reports on library research.

INTRODUCTORY INSECT TAXONOMY. (ENTOMOLOGY 331.)**INTRODUCTORY PARASITOLOGY. (ENTOMOLOGY 351.)****BIOLOGY OF THE ALGAE (COURSES 343, 344.)****374. FIELD MARINE BIOLOGY**

Credit two hours. Prerequisite, a full year of college biology. A special course offered on Star Island, off Portsmouth, New Hampshire, June 11-25, 1966. Professors Anderson, Gilbert, Hewitt, and Raney, Associate Professors Barlow and Kingsbury (in charge).

Living material and habitats will be emphasized in introducing students to the major disciplines of marine biology and in rounding out the student's knowledge of these topics as presented at inland locations. For more details, see the Summer Session Announcement, or consult Professor Kingsbury.

460. MARINE ECOLOGY

Spring term. Credit three hours. Prerequisites, Biological Sciences 101-102 or 103-104 and chemistry and physics. Lectures, M W F 9. Rice 300. Associate Professor Barlow.

Introduction to biological oceanography: the sea as an environment; physical and chemical characteristics of marine habitats, relation to biogeography; organic production, biochemical cycles and distribution of non-conservative properties; relation of hydrography to fisheries and distribution of populations, oceanographic aspects of pollution problems.

461. OCEANOGRAPHY

Fall term. Credit three hours. Prerequisites, introductory chemistry and physics. Lectures, T Th 10. Rice 300. Laboratory, Th 12-12:50. Room to be arranged. Associate Professor Barlow.

Introduction to physical and chemical aspects of the oceans: geography and structure of ocean basins; origin and physical properties of seawater; distribution of salinity and temperature, heat and water budgets, formation of water masses; circulation, waves and tides; shore processes, formation and distribution of sediments; discussion of current problems in oceanography. Laboratory work in organization and analysis of oceanographic observations.

462. LIMNOLOGY

Spring term. Credit four hours. Prerequisites, Biological Sciences 361, organic chemistry, and one year of college physics or permission of instructors. Lecture, W F 11. Plant Science 143. Laboratory, F 2-5; S 9-12. Professor Valleryntyne and Assistant Professor Hall.

A study of processes and mechanisms in the biology, chemistry and physics of inland waters taught from a functional and analytic point of view. Laboratories devoted to both field studies and experiments on model systems.

462A. LIMNOLOGY, LECTURES

Spring term. Credit two hours. Prerequisites, Biological Sciences 361, organic chemistry, and one year of college physics, or permission of instructors. Lecture, W F 11. Plant Science 143. Professor Valleryntyne and Assistant Professor Hall.

The lecture portion of course 462.

470. ICHTHYOLOGY

Spring term. Credit four hours. Prerequisite, Biological Sciences 270 or the equivalent. Lectures, M W 9. Warren 145. Laboratory, F 2-4:30 and S 9-11:30. Fernow 14. Professor Raney.

Lectures on the biology of fishes including systematics, ecology, life history, behavior, and literature. Laboratory studies of the orders, major families, and principal genera, and of systematic procedures. Field studies of the ecology and life history of local species.

471. MAMMALOLOGY

Fall term. Credit four hours. Prerequisites, Biological Sciences 270 or equivalent work in vertebrate biology and permission of instructor. Lectures, T Th 10. Plant Science 37. Laboratory, F 2-4:30 and S 9-11:30. Fernow 210. Associate Professor Layne.

Lectures on various aspects of mammalian biology, including evolution, distribution, systematics, ecology, behavior, and physiology. Laboratory and field work on the ecology, behavior, and life histories of local mammals; the taxonomy of recent mammals, with emphasis on the North American fauna; and special topics.

472. ORNITHOLOGY

Spring term. Credit four hours. Prerequisites, Biological Sciences 270 or equivalent work in vertebrate biology and permission of instructor. Lectures, M W 11. Rice 300. Laboratory, M W 2-4:30. Fernow 210.

Lectures on various aspects of the biology of birds, including structure, classification, adaptations, behavior, distribution, ecology, and physiology. Laboratory and field studies on the identification, ecology, and behavior of local species; classification; structure; molts and plumages; and other aspects of avian biology.

475. EVOLUTIONARY THEORY

Fall term. Credit four hours. Prerequisites, Biological Sciences 281 and one of the following courses: Biological Sciences 270, 371, 341, 343, or 344; or Entomology 212; or Plant Pathology 309; or permission of instructor in writing. Lectures, T Th 11. Comstock 245. Discussion, Th 12. Associate Professor Brown.

Lectures and class discussions on organic evolution, with primary emphasis on the mechanisms of speciation and adaptation.

476. ADVANCED INVERTEBRATE ZOOLOGY

Spring term. Credit four hours. Prerequisites, Biological Sciences 371 or equivalent, and permission of instructor. Enrollment limited. Two lectures

and two laboratories per week. Time and place to be arranged. Professor Anderson.

Lectures and seminars (involving student participation by means of prepared reports) on significant problems in invertebrate zoology; laboratory and field work on selected invertebrate groups.

479. RESEARCH IN ECOLOGY, EVOLUTION, AND SYSTEMATICS

Fall or spring term. Credit and hours to be arranged. Prerequisite, permission of the professor under whom the work is to be taken. Staff.

Practice in planning, conducting, and reporting independent laboratory and/or library research programs.

[561-562. QUANTITATIVE ECOLOGY

Throughout the year. Credit four hours a term. Given in alternate years. Prerequisites, one year of biology and permission of instructor. Organic chemistry and some college mathematics are desirable. Lectures, M W 11. Laboratory, W 2-4:30. Professor Cole.] Not given in 1966-1967.

A quantitative course on selected ecological topics for advanced undergraduates and graduate students. Topics include the origin and interpretation of habitat differences, toleration and response physiology, population dynamics, construction and uses of life tables, spatial distribution patterns, and approaches to the quantitative analysis of biotic communities.

563. PLANT ECOLOGY

Fall term. Credit four hours. Prerequisite, Biological Sciences 361 or the equivalent. Primarily for graduate students. Lectures, M W F 10. East Roberts 222.

Lectures and seminars on species and community organization, competition, laws of growth, and succession, and on the measurement, analysis and interpretation of biogeochemical cycles and the flow of energy in plant communities.

[564. BIOGEOCHEMISTRY

Spring term. Credit four hours. Prerequisites, Biological Sciences 361, one year of geological science, organic chemistry and permission of instructor. Lectures, T Th S 9. Stimson 105. Laboratory, M or T 2-4:30. Professor Vallentyne.] Not given in 1966-1967.

An introduction to the geochemical roles of living organisms, including the chemical composition of the organism-environment complex, the influence of living matter on erosional and depositional processes, biogeochemical cycles, fossil organic matter, and biological transformation of minerals. The laboratory is exclusively devoted to the geochemistry of organic matter.

565. SPECIAL TOPICS IN LIMNOLOGY

Fall term. Credit three hours. Primarily for graduate students. Prerequisite, consent of instructor. Hours to be arranged. Professor Vallentyne, Assistant Professor Hall.

A laboratory and seminar course. Advanced discussion and experimentation in specific topics in limnology. Content variable from year to year, but in general dealing with topics related to the production and metabolism of biological associations in inland water.

ADVANCED INSECT TAXONOMY. (ENTOMOLOGY 531, 532, 533, 534.)

ADVANCED PARASITOLOGY: PROTOZOA AND HELMINTHS. (ENTOMOLOGY 551.)

661. SEMINAR IN POPULATION AND COMMUNITY ECOLOGY

Fall term. Credit one hour. Prerequisites, a course in ecology and permission of instructor. Lecture, M 7:30 p.m. Comstock 145. Assistant Professor Root.

Discussion of recent advances in population and community ecology. The topic for 1966 will be ecological biogeography. Participants will present reports on the determinants of species diversity, convergent evolution, distribution of life-forms, barriers to dispersal, and related subjects. This course may be repeated for credit.

Genetics and Development

280. HUMAN GENETICS

Spring term. Credit three hours. Prerequisite, Biological Sciences 101-102 or 103-104. Students who have had Biological Sciences 281 may register only with the permission of the instructor. Lectures, M W 10. Warren 145. Discussion, F 10. Room to be arranged. Professor Srb.

An introduction to biological heredity through consideration of the genetics of man. Advances in the science of genetics are having a profound effect on man's understanding of himself and on his potential for influencing his present and future well-being. The course is intended primarily to contribute to the student's general education in these matters, and although certain aspects of genetics will be considered with some rigor, the course is not designed to serve as a prerequisite to advanced courses in genetics.

281. GENETICS

Fall or spring term. Credit four hours. Prerequisite, Biological Sciences 101-102 or 103-104. Students who have had Biological Sciences 280 may register only with the permission of the instructor. Lectures, M W F 8. Plant Science 233. Laboratory, M T W Th or F 2-4, or T or Th 8-10. Plant Science 41. Professor Stinson and assistants.

A general study of the fundamental principles of genetics. Discussions of gene transmission, gene action and interaction, gene linkage and recombination, gene structure, gene and chromosome mutations, genetic aspects of differentiation, genes in populations, breeding systems, extrachromosomal inheritance. Animals, plants and microorganisms are used in the laboratory, which also includes as independent study of inheritance in *Drosophila*.

CYTOLOGY. (COURSE 347.)

385. ANIMAL EMBRYOLOGY

Fall term. Credit four hours. Prerequisite, Biological Sciences 281. Lectures, W F 11. Stimson G1. Laboratory, W F 8-10:30 or 2-4:30. Stimson 206. Associate Professor Blackler.

A course in general animal embryology with equal emphasis on the physiological as well as the morphological basis of early development. Vertebrate development is treated on a comparative basis.

CYTOGENETICS. (COURSE 440.)

480. POPULATION GENETICS

Spring term. Credit three hours. Prerequisite, Biological Sciences 281 or the equivalent. Lectures, T Th 11. Plant Science 141. Professor B. Wallace.

A study of factors which influence the genetic structure of Mendelian populations and which are involved in race formation and speciation.

482. PHYSIOLOGICAL GENETICS

Spring term. Credit three hours. Prerequisites, Biological Sciences 281 and a course in organic chemistry. Lectures, M W 8. Plant Science 143. Professor Srb.

The nature and activities of chromosomal and nonchromosomal genetic material are considered in relation to the functional attributes of organisms.

MICROBIAL GENETICS. (COURSE 495.)**486. PLANT DEVELOPMENT**

Spring term. Credit one hour. Prerequisite, Biological Sciences 101-102 or 103-104. Not open to students who have taken Biological Sciences 444-446 or 541-542. Lectures, M W F 10 (for five weeks only). Plant Science 141. Professor Steward and Associate Professor Bierhorst.

The course will deal with problems of growth, development, and morphogenesis, with special reference to plants. There will be 15 lectures delivered in five weeks. These lectures constitute a portion of Biological Sciences 444-446 and 541-545; students who specifically require a short course in plant development may register for 486.

489. RESEARCH IN GENETICS AND DEVELOPMENT

Fall or spring term. Credit and hours to be arranged. Prerequisite, permission of the professor under whom the work is to be taken. Staff.

Practice in planning, conducting, and reporting independent laboratory and/or library research programs.

584. EXPERIMENTAL EMBRYOLOGY

Spring term. Credit three hours. Prerequisite, Biological Sciences 385. Lecture, T 11. Stimson G1. Laboratory, T Th 2-4:30. Stimson 206. Associate Professor Blackler.

An advanced course in animal development in which stress is laid on practical manipulations carried out by the students. Every student will have an opportunity to repeat for himself some of the classical and modern experiments and techniques.

Microbiology

290. GENERAL MICROBIOLOGY

Fall or spring term. Credit five hours. Prerequisites, Biological Sciences 101-102 or 103-104 and Chemistry 104 or 108 or the equivalent. Lectures, M W F 11. Stocking 218. Laboratory, M W 2-4:30; T Th 8-10:30 or 2-4:30. Stocking 301, except spring term, M W section in Stocking 321. Fall term, Professor H. W. Seeley; spring term, Professor VanDemark.

A study of the basic principles and relationships in the field of microbiology, with fundamentals necessary to further work in the subject. The course offering in the spring term will provide special emphasis on the application of microbiology in home economics and agriculture.

290A. GENERAL MICROBIOLOGY, LECTURES

Fall or spring term. Credit three hours. Prerequisites, Biological Sciences 101-102 or 103-104 and Chemistry 104 or 108 or the equivalent. Lectures, M W F 11. Stocking 218. Fall term, Professor H. W. Seeley; spring term, Professor VanDemark.

The same as the lecture part of course 290. Will not serve alone as a prerequisite for advanced microbiology courses.

290B. GENERAL MICROBIOLOGY, LABORATORY

Fall or spring term. Credit two hours. May be taken only by special permission of the instructor. Fall term, Professor H. W. Seeley; spring term, Professor VanDemark.

The same as the laboratory part of Course 290.

390. ADVANCED BACTERIOLOGY

Spring term. Credit four hours. Prerequisites, Biological Sciences 290 and organic chemistry and permission of instructor. Lectures, M W 7 p.m. Stocking 119. Laboratory, T Th 1:40-4:30. Stocking 321. Professor MacDonald.

A comparative study of the physiological and ecological relationships among the bacteria. Among the topics discussed will be cell anatomy, cellular control mechanisms, ecology, taxonomy and autotrophy. Special emphasis will be placed on those groups of bacteria outside of the Eubacteriales. Laboratory emphasis will be on the technique for isolation, cultivation and rigorous study of various groups of bacteria. Emphasis will be on independent work and several laboratory reports will be required.

390A. ADVANCED BACTERIOLOGY, LECTURES

Spring term. Credit two hours. Prerequisites, Biological Sciences 290 and organic chemistry. Lectures, M W 7 p.m. Stocking 119. Professor MacDonald.

This course is the same as the lecture portion of 390, except that the permission of the instructor is not required.

[393. APPLIED AND INDUSTRIAL MICROBIOLOGY

Fall term. Credit three hours. Given in alternate years. Prerequisite, Biological Sciences 290 or the equivalent. Lectures, T Th 11, S 10. Stocking 119. Professors Delwiche, H. W. Seeley, VanDemark.] Not given in 1966-1967.

A survey of the microbiology of industrial fermentations, water, and waste decomposition.

394. DAIRY AND FOOD MICROBIOLOGY

Spring term. Credit four hours. Prerequisite, Biological Sciences 290. Lectures, M W 12. Stocking 119. Laboratory, M W 1:40-4:30. Stocking 301. Professor Naylor.

The major families of microorganisms of importance in dairy and food science are studied systematically with emphasis on the role played by these organisms in food preservation, food fermentations, and public health. The laboratory work includes practice in the use of general and special methods for microbiological testing and control of dairy and food products as well as practice in the isolation and characterization of organisms found in foods.

396. PHYSIOLOGY OF BACTERIA

Spring term. Credit three hours. Prerequisites, Biological Sciences 290 and at least one semester of organic chemistry. Lectures, T Th 10. Stocking 119. Professor Delwiche.

The course is concerned with the functions of microorganisms, primarily bacteria. Particular consideration is given to the dynamics of the growth process, the nutrition and energy metabolism of the developing cultures, and the effects of the physical and chemical environments on the growth process. Primarily the treatment is concerned with the eubacteria, but consideration is given to other microbial forms when appropriate to an integrated treatment of the subject matter.

SOIL MICROBIOLOGY. (AGRONOMY 306.)

PATHOGENIC BACTERIOLOGY. (VETERINARY MEDICINE 340.)

493. MORPHOLOGY AND CYTOLOGY OF BACTERIA

Fall term. Credit three hours. Prerequisite, permission of instructor. Lectures, T Th S 9. Stocking 119. Professor Knaysi.

Morphology, cytology, and microchemistry of microorganisms.

495. MICROBIAL GENETICS

Fall term. Credit four hours. Prerequisites, Biological Sciences 281 and 290 or permission of the instructor. For upperclassmen and graduate students. Lecture, W 7:30-9:30 p.m. Stocking 218. Laboratory, T 1:40-4:30 and other hours to be arranged. Stocking 321. Associate Professor Zahler.

Genetics of bacteria and their viruses, with emphasis on the mechanisms of genetic phenomena.

495A. MICROBIAL GENETICS, LECTURES

Fall term. Credit two hours. Prerequisites, Biological Sciences 281 and 290 or 290A. For upperclassmen and graduate students. Lecture, W 7:30-9:30 p.m. Stocking 218. Associate Professor Zahler.

The course is the same as the lecture portion of Biological Sciences 495.

496. CHEMISTRY OF MICROBIAL PROCESSES

Spring term. Credit two hours. Prerequisites, beginning courses in general microbiology, biochemistry, and organic chemistry. Course intended for upperclassmen and graduate students. Lectures, M W 11. Stocking 119. Professor Delwiche.

Selected topics pertaining to the energy metabolism, oxidative and fermentative abilities, and biosynthetic capacities of microorganisms. Where possible and appropriate the subject matter deals with the various microbial forms in a comparative sense.

498. VIROLOGY

Spring term. Credit three hours. Given in alternate years. Prerequisites, Biological Sciences 290 and 281 and permission of the instructor. Lectures, T Th S 11. Stocking 218. Professor Naylor, assisted by Professor Ross and Associate Professor Carmichael.

A study of the basic physical, chemical, and biological properties of plant, animal and bacterial viruses.

499. RESEARCH IN MICROBIOLOGY

Fall or spring term. Credit and hours to be arranged. Staff.

For advanced students of high academic standing. A program of research projects in various aspects of basic microbiology.

590. METHODS IN ADVANCED BACTERIOLOGY

Spring term. Credit four hours. Given in alternate years. Primarily for graduate students. Prerequisite, permission of instructor. Limited enrollment. Hours to be arranged. Professor MacDonald.

Intended to acquaint advanced students with some of the more important techniques used in the study of bacterial physiology. Emphasis will be placed on the use of radioisotopes; growth, structure, and function of cells.

ADVANCED SOIL MICROBIOLOGY. (AGRONOMY 506.)**699. MICROBIOLOGY SEMINAR**

Fall and spring terms. Without credit. Th 4:15. Stocking 119. Staff.

Required of graduate students majoring in microbiology and open to all who are interested.

CONSERVATION

The Department of Conservation offers a wide variety of training in the natural resources area. For undergraduates there are sequences in fishery biology and wildlife management, and for graduate students there are also two additional major subjects available, natural resources conservation and forest conservation. The sequence for students in soil and water conservation is given in the Department of Agronomy, and a curriculum for those interested in conservation education has been developed in cooperation with the Department of Rural Education.

Natural Resources Conservation

110. CONSERVATION OF WILDLIFE

Fall term. Credit two hours. Lectures, T Th 11. Stocking 218. Professors Clausen Conklin, Hewitt, Pimentel, Raney, Swanson (in charge), and Webster, Associate Professors Barlow, Brumsted, Hamilton, and Thompson, Assistant Professor McNeil, and cooperating specialists.

An introduction to the wildlife resources of North America and their interrelations with other resources; the importance of the flora and fauna in our economic and cultural life. Serves as an introductory course for conservation majors and is of general cultural and informational interest to students in other fields.

201. CONSERVATION OF NATURAL RESOURCES

Spring term. Credit two hours. Lectures, T Th 10. Caldwell 100. Associate Professor Hamilton.

The natural resources situation and problems in the United States. A consideration of the soil, water, forest, wildlife, grassland, minerals, and recreational resources of the United States and their adequacy to meet the demands of an increasing population undergoing rapid urbanization. Emphasis on water and watersheds as resource planning and development units. Current resource use conflicts.

510. SELECTED TOPICS IN CONSERVATION

Fall term. Credit one hour. F 8. Fernow 210. Professor Swanson.

Open to upperclassmen only by permission of instructor. Discussions of important conservation problems of current interest.

602. SEMINAR IN NATURAL RESOURCES PLANNING AND DEVELOPMENT

Spring term. Credit two hours. W 2-4. Place to be arranged. Associate Professor Hamilton.

An interdisciplinary graduate student seminar. Seminar theme varies from year to year to include such topics as: Small watershed planning, multiple use management, urban fringe problems, outdoor recreation, land use planning methods and river basin development. Field trips and invited resource specialists. For 1966 the focus will be on land use planning.

Forestry

301. SMALL WOODLOT MANAGEMENT

Fall term. Credit three hours. Lectures, M W 11. Laboratory, W 1:40-4. Rice 300. Note: field laboratories will sometimes end as late as 5:30 in good weather.

This will be compensated by elimination of the laboratory period during a portion of the cold weather at the end of the term. Associate Professor Morrow.

Designed to give the student the basic information necessary to implement sound management practices in a woodland tract. Field trips to woodlots will emphasize variations in value and potential. Actual practice in tree identification, log scaling, timber estimating, tree marking, and cutting in immature stands is given. Each student is assigned an area of woods to put his knowledge of forestry into practice.

302. FOREST ECOLOGY AND MANAGEMENT

Fall term. Credit three hours. Lectures, M W 11. Laboratory, M 2-4:30. Fernow 212. Associate Professor Hamilton.

Primarily for those majoring in wildlife management and allied conservation fields. A study of the forest ecosystem and ways in which it may be modified to provide a range of products and services. All laboratory sessions in the field. One weekend trip to the Adirondacks or other major forest region of the State.

Fishery Biology

440. FISHERY SCIENCE

Fall term. Credit three hours. Students other than majors in the Department of Conservation must have permission of instructor to register. M W F 12. Rice 300. Professor Webster.

Principles and theories involved in dynamics of fish populations. Methods of obtaining and evaluating statistics of growth, population size, mortality, yield, and production, as well as investigational aspects of fishery biology are included.

441. FISHERY RESOURCE MANAGEMENT

Spring term. Credit three hours. Prerequisite, Course 440 or permission of instructor. Lectures, T Th 11. Discussion to be arranged. Rice 101. Associate Professor Eipper.

Principles and problems in the management of freshwater and marine fishery resources, considered in relation to problems of human population and management of other natural resources. Multiple use, evaluation, and allocation of water resources, with particular reference to fisheries. Characteristics of fishery resources and their exploitation. Applications of fishery science to the management of fish stocks through maintenance and improvement of habitat, fish population manipulation, and regulation of fishing.

442. BASIC PRINCIPLES OF FISH CULTURE

Spring term. Credit two hours. Prerequisites, general zoology and a course in chemistry. A course in biochemistry or physiology is desirable. Lecture, M 12. Laboratory, M 2-4:30. Fernow 210. Associate Professor A. M. Phillips.

A study of the nutrition, metabolism, and physiology of hatchery fish and principles of hatchery management.

501. BIOMETRICS OF FISH AND WILDLIFE

Fall term. Credit three hours. Prerequisites, Courses 440 and 441 or 413, elementary differential and integral calculus, and Plant Breeding 510, or permission of instructor. Lectures, M W 10. Laboratory to be arranged. Fernow 210. Assistant Professor Regier.

Mathematical models and statistical methods useful in measuring ecological processes, particularly those of importance in managing fish and wildlife

populations. The characteristics of sampling designs as determined by the properties of the chosen mathematical model, animal behavior, selection characteristics of the sampling gear, and investigational costs. Reliability of estimates; some parametric and non-parametric methods for testing hypotheses. Laboratory work includes experience in data collection and analysis.

[600. SEMINAR: MAJOR FISHERY INVESTIGATIONS

Spring term. Credit one hour. Given in alternate years. Prerequisite, permission of instructor. W 12. Staff.] Not given in 1966-1967.

A comparative review of major fishery investigations of the world constitutes the primary content of seminar. A study of pertinent literature and special topics will be assigned.

601. SEMINAR ON SELECTED TOPICS IN FISHERY BIOLOGY

Fall or spring term. Credit one hour. Time to be arranged. Staff.

Wildlife Management

411. PRINCIPLES OF WILDLIFE MANAGEMENT

Fall term. Credit three hours. Prerequisite, consent of instructor. Lectures, M W F 10. Rice 101. Professor Hewitt.

Fundamental mechanisms of wildlife populations; ecological, social, and economic aspects of wildlife management.

412. WILDLIFE MANAGEMENT LABORATORY

Fall term. Credit one hour. Required of wildlife management majors registered in Conservation 411. Field and laboratory, F 2-4:30, and several field trips to be arranged. Fernow 212. Professor Hewitt.

413. WILDLIFE MANAGEMENT METHODS

Spring term. Credit three hours. Prerequisites, Courses 411 and 412. Lecture, F 11. Laboratory, F 1:40-4:30. Fernow 212. Several all-day field trips. Professor Hewitt.

Methods and techniques in the management of game species and their practical application in the field. Intended for students interested in professional wildlife management.

414. ECONOMIC ZOOLOGY

Spring term. Credit two hours. Prerequisite, Biological Sciences 270. W F 8. Rice 300. Professor Eadie.

Economics of amphibians, reptiles, birds, and mammals. Economic status, habits, and control of injurious species.

Research

Either term. Credit and hours to be arranged. Problems are undertaken in any of the fields of study in the Department, but adequate preparation in the specialized field, and permission of the instructor are prerequisites. Fernow Hall.

492. MAMMALOLOGY

Professor Eadie.

494. FISHERY BIOLOGY

Professor Webster, Associate Professors Eipper and A. M. Phillips, Jr., and Assistant Professors Forney and Regier.

495. WILDLIFE MANAGEMENT

Professors Swanson, Hewitt, and Eadie, and Associate Professor Thompson.

496. FORESTRY

Associate Professors Hamilton and Morrow.

498. NATURAL RESOURCES

Professor Swanson and Associate Professors Brumsted and Hamilton.

Departmental Seminar

610. CONSERVATION SEMINAR

Fall and spring terms. Without credit. Th 4:30-6:00 p.m. Place to be arranged. Staff.

Discussions of literature and current research in the broad field of conservation and vertebrate zoology.

DRAWING

Freehand Drawing and Illustration

109-110. DRAWING FOR LANDSCAPE STUDENTS

Throughout the year. Credit three hours a term. Credit may not be received for both Course 109 and Course 111. Fall term is prerequisite to spring term. Fall term, W F 2-4:30; spring term, M W F 11-12:50. Mann 500. Associate Professor Lambert and Assistant Professor Elliot.

Planned to develop practical ability in the sketching of outdoor planting and landscape features, facilities in lettering, and knowledge of isometric and perspective construction from plans and elevations. Sketchbook assignments, to be done outside class, are given throughout the year.

111. FREEHAND DRAWING

Fall or spring term. Credit three hours. Credit may not be received for both Course 109 and Course 111. Prerequisite, permission of instructor to register. For beginning students. Lecture, T or W 10. Six hours of time, including the lecture period, are to be spent in the drawing room, preferably in two-hour units. These hours must be scheduled between 9 and 11 M W F or T 2-4 in the fall term, and between 9 and 12 M T W Th F or T 2-4 in the spring term. Mann 500. Associate Professor Lambert and Assistant Professor Elliot.

The objective is to develop accuracy of observation and skill in delineation. Practice is given in outdoor sketching and in the drawing of still-life set-ups, interior scenes, and human figures. The principles of freehand perspective are taught and applied. The course is designed to aid those who plan to work in nature study, biological sciences, and home economics. Sketch-book assignments to be done outside class are given throughout the year.

312. FREEHAND DRAWING AND ILLUSTRATIONS

Fall term. Credit two hours. Prerequisite, Drawing 111 or the equivalent. Six hours of time, including one lecture period arranged during the first week, are to be spent in the drawing room, preferably in two-hour units. These hours may be scheduled between 9 and 12 M T W Th F. Mann 500. Associate Professor Lambert.

This course carries on from the object drawing of the beginning course to the organization of a complete illustration. The subject matter is derived

largely from quick, on-the-spot sketches. Composition, perspective relationships, and ways of rendering are all considered. The work is planned primarily to help students who expect to use their sketching ability in landscape work, interior decorating, or the illustrating of their own papers, bulletins, and books.

214. WATER COLOR ILLUSTRATION

Spring term. Credit two hours. Prerequisite, Course 111 or the equivalent. Six hours of practice must be scheduled, preferably in two-hour units, between 9 and 12 M T W Th F or T W 2-4. Mann 500. Associate Professor Lambert.

The student learns to mix colors, lay washes, and plan the values of his composition before he tries illustration in color.

316. ADVANCED DRAWING

Fall or spring term. Credit two hours. Three hours of practice required for each hour of credit. Prerequisite, Courses 110, 312, or the equivalent. Mann 500. Associate Professor Lambert and Assistant Professor Elliot.

For students who wish to attain proficiency in some particular type of illustration or technique.

417. SCIENTIFIC ILLUSTRATION

Fall term. Credit two hours. Prerequisite, Course 212 or permission of the instructor. Six hours of practice to be scheduled, preferably in two-hour units. These hours may be scheduled between 9 and 12 M T W Th F. Assistant Professor Elliot.

A survey of illustration methods suitable for different scientific fields; training in the techniques of pen and ink, scratch board, stipple board, wash, and color overlays. Instruction in the use of the camera lucida, pantograph, projectoscope, and other time-saving methods of getting accurate results as quickly as possible. Methods of reproducing illustrations are studied in relation to cost and problems of publication.

ENTOMOLOGY AND LIMNOLOGY

Students are accepted as majors in entomology and limnology only upon the consent of the head of the department or of a member of the staff designated to act for him. Except in certain fields, this will normally be done only at the end of the sophomore year. Certain prescribed courses are required.

General Entomology

210. INTRODUCTORY ENTOMOLOGY

Spring term. Credit three hours. Prerequisite, Biological Sciences 101 and 102 or 103-104, or their equivalent. Lecture, T Th 9. Comstock 245. Laboratory, M T W Th or F 2-4:30. Comstock 100. Associate Professor Raffensperger and assistants.

A survey of the structure, biology, and classification of insects; an introduction to the study of insects as a major segment of the biological community, with attention to representative species of economic importance, the techniques and consequences of their control. Laboratory exercises in the anatomy and biology of insects and practice in the techniques of insect identification.

212. INSECT BIOLOGY

Fall term. Credit three hours. Prerequisite, Biological Sciences 101 and 102, or 103-104 or their equivalent. Lecture, W F 11. Comstock 145. Laboratory, W

Th or F 2-4:30. Comstock 100. Associate Professor Raffensperger and Assistant Professor Pennell and assistants.

Designed to introduce the science of entomology by focusing on the basic principles of the systematics, morphology, physiology, behavior, and ecology of insects.

518. TECHNIQUES OF BIOLOGICAL LITERATURE

Fall term. Credit two hours. Given in alternate years. Lectures, T Th 9. Comstock 300. Professor Franclemont.

History of the development of entomological literature and a critical study of the biologists' works of reference and the principles of zoological nomenclature. Practice in the use of indices and bibliographies, and practice in the preparation of the latter.

Insect Morphology

322. INSECT MORPHOLOGY AND HISTOLOGY

Spring term. Credit four hours. Prerequisite, Course 210 or 212 or permission of instructor. Lectures, T Th 11. Laboratories, M W 1:40-4:30. Comstock 270. Associate Professor Eisner.

The principles of morphology, as illustrated by insects. Topics are considered at the anatomical, histological, and cytological levels. Emphasis is placed on special problems in morphogenesis, adaptive radiation, and functional anatomy. The various topics are considered in the light of modern evolutionary theory, and an effort is made to relate them to recent behavioral and physiological work. The laboratory is devoted largely to dissection and histological technique.

Insect Taxonomy

331. INTRODUCTORY INSECT TAXONOMY

Spring term. Credit three hours. Prerequisite, Course 210 or 212. Lecture, Th 10. Laboratory, T Th 2-4:30. Comstock 300. Associate Professor Brown.

An introduction to the systematics and distribution of insects. Laboratory practice in the identification of orders, families, and representative genera of insects; methods of collection and preparation of insect specimens. Field trips are taken in the late spring.

[531. TAXONOMY OF THE SMALLER ORDERS OF INSECTS

Fall term. Credit three hours. Given in alternate years. Prerequisite, Course 331. Lecture, F 10. Laboratory, F 2-4:30 and one other by arrangement. Comstock 300. Associate Professor Brown.] Not given in 1966-1967.

Lectures on the classification, evolution, and bionomics of the orders and families of insects, exclusive of the larger orders of Holometabola. Laboratory studies on the literature and on the characters and classification of representative genera and species. Continuation of taxonomy of Holometabola is in Courses 532, 533, and 534.

532. TAXONOMY OF THE IMMATURE STAGES OF HOLOMETABOLA

Fall term. Credit three hours. Given in alternate years. Prerequisite, Course 531 or permission of the instructor. Lecture, F 10. Laboratory, F 2-4:30 and one other by arrangement. Comstock 300. Professor Franclemont.

Lectures on the structure and habits of insect larvae. Laboratory studies of

the literature, comparative morphology, and identification of the immature stages of the Holometabola.

533. TAXONOMY OF THE COLEOPTERA AND LEPIDOPTERA

Spring term. Credit three hours. Given in alternate years. Prerequisite, Course 331. Lecture, W 10. Laboratories W F 2-4:30. Comstock 300. Professor Franclemont

Laboratory studies on the literature and on the characters and classification of representative genera and species of these orders.

[534. TAXONOMY OF THE DIPTERA AND HYMENOPTERA

Spring term. Credit three hours. Given in alternate years. Prerequisite, Course 331. Lecture, W 12. Laboratory, F 2-4:30 and one other by arrangement. Comstock 300. Associate Professor Brown.] Not given in 1966-1967.

Laboratory studies on the literature and on the characters and classification of representative genera and species of these orders.

EVOLUTIONARY THEORY. (BIOLOGICAL SCIENCES 475.)

Economic Entomology

441. GENERAL ECONOMIC ENTOMOLOGY

Fall term. Credit three hours. Prerequisite, Course 210 or 212 or the equivalent. Lectures, T Th 9. Comstock 145. Laboratory, T 2-4:30. Comstock 100. Professor Gyrisco.

Principles and techniques in the control of insects.

541. SPECIAL TOPICS IN ECONOMIC ENTOMOLOGY

Fall term. Credit three hours. Given in alternate years. Permission to register is required. Prerequisites, Entomology 210 or 212 and Plant Breeding 510. Lectures, M W F 11. Comstock 245. Laboratory and one or more field trips to be arranged. Comstock 145. Professor Gyrisco.

A course dealing with principles of control for insects of field and forage crops, forage seed crops, and small grains. Emphasis is placed on field plot techniques, practical experimental designs, sampling, analysis of data; insecticide residues on forage, in milk and meat, the problems and limitations they involve; and effects of toxic residues on pollinating insects. Laboratories deal with sight identification of arthropod pests of field crops, field plot layouts, and instrumentation for field work in insect biology.

[542. SPECIAL TOPICS IN ECONOMIC ENTOMOLOGY.

Spring term. Credit three hours. Given in alternate years. Permission to register is required. Lectures, M W 11. Comstock 145. Laboratory, F 11-1. Comstock 100. Professors Brann and Dewey.] Not given in 1966-1967.

A continuation of Course 541. Topics treated: Insecticide application equipment and insect pests of fruit.

[543. SPECIAL TOPICS IN ECONOMIC ENTOMOLOGY

Fall term. Credit three hours. Given in alternate years. Permission to register is required. Lectures, M W F 11. Comstock 245. Associate Professors Morse and Weidhaas.] Not given in 1966-1967.

A continuation of Courses 541 and 542. Topics covered: Large scale insect eradication; control programs and insect pests of woody ornamentals.

545-546. ECONOMIC ENTOMOLOGY

Throughout the year. Credit three hours each term. Prerequisites, Course 210 or 212 and permission to register (see Professor Gyrisco). Open to quali-

fied juniors and seniors but designed primarily for graduate students, particularly those majoring or minoring in entomology. Lecture, T 10-12. Comstock 145. Laboratory, T 2-4:30. Comstock 100. Professors Berg, Brann, Dewey, Glass, Gyrisco, Matthyse, O'Brien, and Pimentel; Associate Professors Eisner, Lisk, McEwen, Morse, Muka, and Weidhaas; and Assistant Professors Johnson and Pennell.

A special topics course dealing with principles and problems of economic entomology such as insect population dynamics, natural control of insects, specificity of insecticides, nature of chemical control, resistance in insects, residues in food crops, attractants and repellants, insect pathology, integrated control, parasites and biocontrol, planning experiments, experimental design, and techniques and other special topics of applied entomology.

Parasitology

351. INTRODUCTORY PARASITOLOGY

Every spring term. Credit four hours. Prerequisite, Biological Sciences 101-102, or 103-104 or their equivalent. Course 210 or 212 is also recommended. Limited to 12 students per section. Lectures, M W 10. Comstock 245. Laboratories, M W 2-4:30, T 10-12:30 or 2-4:30 and Th 10-12:30 or 2-4:30. Comstock 200. Professor Travis.

An introduction to the symbiotic way of life among animals, primarily the protozoan, helminth, and arthropod species of temperate and tropical areas. Special emphasis is given to the recognition of selected symbiotic species and how they live with their hosts.

551. ADVANCED PARASITOLOGY (PROTOZOA AND HELMINTHS)

Fall term. Credit three hours. Given in alternate years. Undergraduates only by permission. Prerequisite, Course 351 or its equivalent. Lecture and one laboratory, T 1-4:30, and Th 2-4:30. Comstock 200. Professor Travis.

A continuation of Course 351 for graduate students interested in the parasitic protozoa and helminths. Practical experience with methods of collection, preparation; detailed studies on recognition and life cycles. Special emphasis is given to the parasites that are transmitted by arthropods in the tropics.

[552. ADVANCED PARASITOLOGY (MEDICAL ENTOMOLOGY)]

Fall term. Credit three hours. Given in alternate years. Undergraduates only by permission. Prerequisites, Courses 351 and 212 or their equivalent. Lecture and one laboratory, T 1-4:30 and Th 2-4:30. Comstock 200. Professor Travis.] Not given in 1966-1967.

A continuation of Course 351 for graduate students interested in medical or veterinary entomology. Practical experience with methods of collection, preparation; detailed studies on recognition, life cycles and control. Special emphasis is given to causative agents, vectors, and intermediate hosts of disease-producing organisms. The study examples include species of worldwide distribution, especially those of tropical areas.

553. ADVANCED PARASITOLOGY (INSECT PATHOLOGY)

Spring term. Credit three hours. Prerequisites, Courses 210 or 212 and 351 or their equivalents and permission of instructor. By appointment. Associate Professor Kramer.

A survey of microbial and zooparasitic diseases of insects. Topics include the causative agents, diagnosis, pathogenesis, pathogenicity and epizootiology.

Apiculture

260. INTRODUCTORY BEEKEEPING

Spring term. Credit two hours. Lectures, T Th 11. Comstock 245. Associate Professor Morse.

Intended to afford a general knowledge of the fundamentals of beekeeping, including the life history, instincts, and general behavior of honey bees. Special attention is given to the role of bees in the cross-pollination of agricultural crops, as well as production of honey and beeswax.

262. BIOLOGY OF THE HONEY BEE

Fall term. Credit one hour. Prerequisite, Biological Sciences 103-104 or the equivalent. Limited to 10 students, registration only by permission. Fifteen laboratories by arrangement in September and October only. Associate Professor Morse.

A laboratory and field course in which the classical experiments on the vision, chemical senses, and language of the honey bee, as described by von Frisch are repeated. Laboratories include demonstration of the sex attractant, swarm orientation, the natural nest and a study of wasp, bumble bee and other social insect nests.

[560-561. ADVANCED BEEKEEPING

Throughout the year. Credit three hours a term. Given in alternate years. Prerequisites, Courses 210 or 212 and 260 and previous beekeeping experience. By appointment. Associate Professor Morse.] Not given in 1966-1967.

An advanced course for those specializing in apiculture. Considerable time is devoted to a study of the entire field of beekeeping. Laboratory work covers bee behavior, external and internal anatomy, disease diagnosis, honey and beeswax production and preparation for market, and the management of colonies for pollination service.

562-563. SPECIAL TOPICS IN BEEKEEPING

Throughout the year. Credit three hours a term. Given in alternate years. Registration by permission; open to qualified juniors and seniors. By appointment. Associate Professor Morse.

A technical course designed for advanced students, and covering scientific investigation in all phases of the subject. Special attention is given to improved methods of apiary and honeyhouse management and the preparation of honey for market. Current literature on beekeeping is assigned, reviewed, and evaluated by students. Lectures and discussions are supplemented by field trips.

Environmental Biology

195. ENVIRONMENTAL BIOLOGY

Fall and spring terms. Credit three hours. Tutorial, weekly discussions by arrangement. Professor Pimentel and Associate Professor Kramer.

Principles of interaction between living systems and their resources are considered. Particular emphasis will be given to current problems in the management of our natural resources and research underway in many of the frontier areas of environmental biology.

GENERAL ECOLOGY. (BIOLOGICAL SCIENCES 361.)

Fall and spring terms. Credit three hours. See full detailed description under "Biological Sciences."

[271. AQUATIC ENTOMOLOGY AND LIMNOLOGY.

Spring term. Credit three hours. Professor Berg.] Not given in 1966-67.

572. ADVANCED LIMNOLOGY

Fall term. Credit three hours. Prerequisites, Biological Sciences 462 and permission to register. Normally limited to graduate students majoring or minor-ing in limnology. Lecture and laboratory, T 2-4:30, and one additional laboratory or field trip, by arrangement. Comstock 110. Professor Berg.

Discussions and analyses of current limnological concepts and problems, including the critical study of selected reference works and research papers.

FISHERY BIOLOGY AND FISH CULTURE

See description under "Conservation" on pages 89 and 90.

Insect Physiology and Biochemistry

583. INSECT PHYSIOLOGY AND BIOCHEMISTRY

Spring term. Credit six hours. Permission to register is required. Lectures, M W F S 9. Comstock 145. Laboratories, M T 2-4:30 or Th F 2-4:30. Insectary. Professor Patton and Associate Professor Young.

A comprehensive course in the physiology and biochemistry of insects, primarily for graduate students majoring in entomology.

Insect Toxicology and Insecticidal Chemistry

[590. INSECT TOXICOLOGY

Fall term. Credit four hours. Given in alternate years. Prerequisites, Course 341, general chemistry, and organic chemistry. Undergraduate students by permission. Lectures, M W 9. Comstock 145. Laboratories, M W 2-4:30 or T Th 9-11:30. Insectary 130. Professor Dewey.] Not given in 1966-67.

A discussion of toxicological factors affecting insects. A study of insecticides including physical factors affecting formulation, toxicity to insects, and the principles of evaluating their effects on insects.

[591. INSECTICIDE CHEMISTRY AND ACTION

Spring term. Credit three hours. Given in alternate years. Prerequisites, general chemistry and organic chemistry. Undergraduate students by permission. Lectures, M F 9. Comstock 145. Credit three hours. Laboratory, W 1:30-4:30. Comstock 50 or Pesticide Residue Laboratory. Professor O'Brien and Associate Professor Lisk.] Not given in 1966-67.

The chemistry of insecticides, and their metabolism and mode of action in insects and mammals with emphasis on the relation between structure and activity. Analytical techniques of use in structure elucidation and residue evaluation.

Research

RESEARCH

Fall and spring terms. Credit to be arranged. Prerequisite, permission to register from the professor under whom the work is to be taken.

510. INSECT ECOLOGY

Professor Pimentel and Assistant Professor Root.

98 EXTENSION TEACHING

515. INSECT PATHOLOGY

Associate Professor Kramer.

520. INSECT MORPHOLOGY, HISTOLOGY AND EMBRYOLOGY

Associate Professor Eisner.

530. TAXONOMY

Professor Franclemont, and Associate Professors Brown, Keeton and Pechuman.

540. ECONOMIC ENTOMOLOGY

Professors Brann, Dewey, Gyrisco, Matthyse, Muka, and Rawlins; Associate Professors Lisk, Raffensperger, Semel, and Weidhaas; and Assistant Professor W. T. Johnson.

550. MEDICAL ENTOMOLOGY AND PARASITOLOGY

Professor Travis, and Associate Professor Kramer.

564. APICULTURE

Associate Professor Morse.

570. LIMNOLOGY

Professor Berg; Assistant Professor Hall.

585. INSECT PHYSIOLOGY

Professor Patton.

586. INSECT BIOCHEMISTRY

Associate Professor Young.

595. TOXICOLOGY OF INSECTICIDES

Professors Dewey and O'Brien, Associate Professors Lisk and Young, and Assistant Professor Pennell.

596. CHEMISTRY OF ACTION OF INSECTICIDES

Professors Dewey and O'Brien, Associate Professors Lisk and Young, and Assistant Professor Pennell.

Seminar

JUGATAE

Fall and spring terms. M 4:30-5:30. Comstock 245.

The work of an entomological seminar is conducted by the Jugatae, an entomological club that meets for a discussion of the results of investigations by its members.

EXTENSION TEACHING

Communication

200. THE PROCESS OF COMMUNICATION

Fall term. Credit three hours. M W F 8. Warren 245. Assistant Professor Campbell.

Introduction to the basic theories of the communication process. A study of the characteristics of human communication and their theoretical and practical implications in agriculture and home economics. Results of re-

search in the communication process are examined to increase understanding of how ideas are transmitted and received. Lectures are supplemented with case histories illustrating the effectiveness of the communication process.

501. INTERNATIONAL COMMUNICATION

Spring term. Credit two hours. Open to graduate students. Seniors admitted by permission of instructor. T Th 11. Warren 232.

Study of communication at the international level with special reference to social and cultural influences. Analysis of problems that hinder cross-cultural communication. Emphasis on communication for effecting change in developing countries.

Journalism

215. INTRODUCTION TO MASS MEDIA

Spring term. Credit three hours. M W F 10. East Roberts 222. Associate Professor Russell.

An introductory course which explores policies, philosophies, and practices of communication media. Special consideration is given to the style and technique used in preparing and presenting agricultural, home economics and other specialized informational material in newspapers, magazines, radio, and television. Freedom of the press, ethics, libel, and slander are considered in the day-to-day function of the media.

312. AGRICULTURAL ADVERTISING AND PROMOTION

Fall term. Credit two hours. Open to juniors and seniors, and to other students by permission of the instructor. M 2-4. Warren 245. Associate Professor Russell and guest lecturers from advertising agencies.

The use of commercial advertising and sales promotion methods and media in promoting the sale of products and new or improved farm and home practices and programs. Includes market analysis, planning of the advertising and/or promotion units, selection of media, preparation of copy, and sales-promotion pieces.

313. WRITING FOR MAGAZINES

Spring term. Credit three hours. Open to juniors, seniors, and graduate students. M 1:40-4:30. Roberts 131. Professor Ward.

Deals chiefly with the writing of fact articles for publication in agricultural, home economics, or general magazines. Students may write on any subject they choose. The articles and publication markets are analyzed.

315. NEWS WRITING

Fall term. Credit three hours. M W F 8. Roberts 131. Assistant Professor Carl.

The writing and analyzing of news stories. The study of the elements of news, the lead, style, and structure, types of stories, news sources, and the writing of agriculture and home economics news. Discussion and criticism of material written by students.

PREPARATION OF PUBLICATIONS. (HOME ECONOMICS 310.)

Fall term. Credit three hours. Registration by permission of instructor. T 9 and Th 9-11. Field trips. Assistant Professor Hall and guest lecturers. See Announcement of the College of Home Economics.

Oral and Written Expression

100. ORAL AND WRITTEN EXPRESSION

Throughout the year. Credit three hours a term. Fall term is prerequisite to spring term. Not open to four-year students. Lectures and practice: Fall term: M W F 8. or T Th S 10, Warren 231, or M W F 9. Comstock 145; Spring term: M W F 8, 9, or 11, Warren 231. Criticism, by appointment, daily 8-5 and S 8-1. Associate Professor Martin, Assistant Professor Campbell, and Mr. Lueder.

Practice in oral and written presentation of topics in agriculture and other fields, with criticism and individual appointments on the technique of public speech. Designed to encourage interest in public affairs, and through demonstrations and the use of graphic materials and other forms, to train for effective self-expression in public. Special training is given to competitors for the Eastman Prizes for Public Speaking. In addition, some study is made of representative work in English literature. Part of the work in the second term is a study of parliamentary practice.

205. PARLIAMENTARY PROCEDURE

Fall or spring term. Credit one hour. Not open to freshmen. F 12. Warren 131. Associate Professors Freeman and Martin.

Principles and practice of parliamentary procedure including formation of constitution and by-laws. Emphasis on individual practice in conducting meetings.

301. ORAL AND WRITTEN EXPRESSION

Fall or spring term. Credit two hours. Open to juniors and seniors. The number in each section is limited to twenty students. Lectures and practice: Fall term, M W 9, T Th 9, 10, or 11, W F 10; spring term, M W 9, T Th 9 or 11. Warren 131. Criticism, by appointment, daily 8-5, S 8-1. Associate Professors Freeman and Martin, Assistant Professor Campbell, and Mr. Lueder.

Practice in oral and written presentation of topics in agriculture, home economics, and other fields, with criticism and individual appointments on the technique of public speech. Designed to encourage interest in public affairs, and, through demonstrations and the use of graphic materials and other forms, to train for effective self-expression in public. Special training is given to competitors for the Eastman Prizes for Public Speaking. (See page 158.)

302. ORAL AND WRITTEN EXPRESSION

Spring term. Credit two hours. Prerequisite, Course 301. Lectures and practice, T Th 10 or W F 10. Warren 131. Criticism, by appointment, daily 8-5, S 8-1. Associate Professors Freeman and Martin and Assistant Professor Campbell.

A continuation of Course 301 with emphasis on longer speeches and the use of visual aids. Individual appointments are scheduled to aid in preparation of each speech.

[401. ADVANCED ORAL EXPRESSION

Spring term. Credit two hours. Prerequisites, Courses 301 and 302 or permission of the instructor. M W 12. Warren 131. Associate Professors Freeman and Martin.] Not given in 1966-1967.

An advanced course of study and practice in oral expression as directly related to careers of students. Opportunity is provided for each student to present and receive criticism in oral presentation of topics directly related to his field of interest.

Radio-Television

220. RADIO BROADCASTING AND TELECASTING

Spring term. Credit three hours. M W F 9. Roberts 131. Associate Professor Kaiser.

An introductory course to familiarize students, particularly those in agriculture and home economics, with the best methods of presenting ideas by radio and television. Practice includes preparing and presenting radio talks; continuity writing and program arrangements.

422. TELEVISION PRODUCTION AND PROGRAMING

Fall term. Credit two hours. Open to juniors, seniors, and graduate students. T 2-4. Roberts 131. Associate Professor Kaiser.

A survey of television as a means of getting information to the public. A study is made of the techniques employed in televising informational-type programs. Students prepare formats and scripts and present programs before a closed-circuit camera chain. Evaluation or criticism of the programs is made by the instructor and the class.

Research

495. UNDERGRADUATE RESEARCH

Fall and spring terms. Credit one to three hours. Open only to seniors majoring in the department who obtain written permission of professors supervising their work.

Designed to permit outstanding undergraduates to carry out independent studies in communications research under appropriate supervision. Departmental staff.

Visual Aids

430. INTRODUCTORY PHOTOGRAPHY

Spring term. Credit three hours. Limited to 36 students. Registration by permission of instructor. Lectures, S 9-12. Roberts 131. Four laboratory periods will be assigned each student from 7 until 10 p.m., at the mutual convenience of the students and the instructor. Professor E. S. Phillips.

An introduction to the principles of photography in sufficient depth to train students to correlate principles to specific problems encountered in the various branches of photographic work. Laboratory exercises, assignments, and a term paper are intended to develop proficiency with the media and familiarity with the use of photography in the various forms of communication.

431. VISUAL AIDS: THEIR SCOPE, PREPARATION, AND USE

Fall term. Credit two hours. Open to juniors, seniors, and graduate students. S 9-11. Roberts 131. Professor E. S. Phillips and departmental staff.

Concerned with basic communication, aspects peculiar to visual communication, and designed to familiarize the student with the forms, purposes, preparation, and use of all types of visual aids (slide sets, motion and news photography, exhibits, posters, and other media), useful to teaching, promotion, or public relations problems in agriculture and home economics. Includes practice in selecting and planning specifically assigned problems.

FLORICULTURE AND ORNAMENTAL HORTICULTURE

Instruction in the Department of Floriculture and Ornamental Horticulture is planned for students with the following interests: (1) commercial plant production, distribution, or utilization, including the management of greenhouses, nurseries, and wholesale and retail establishments; (2) developing a landscape service, including the planning, construction, planting, and maintenance of small properties; (3) superintendence of parks, golf courses, cemeteries, arboretums or garden centers; (4) the culture and use of ornamental plants in the home garden and in the home; (5) turfgrass production and management; (6) scientific research and teaching.

Special curricula are set up to meet the needs of those students desiring training in the above fields.

Undergraduate students may plan their course as preparation for graduate training leading to university teaching, or research positions with universities, experiment stations or industry.

Courses 101, 103, 210, 212, 213, 215, and 423, are required of all students majoring in the Department. These students must also satisfy the department practice requirement based on experience with ornamental plants and their culture.

General Courses

GENERAL HORTICULTURE. (VEGETABLE CROPS 103.)

101. GENERAL FLORICULTURE AND ORNAMENTAL HORTICULTURE

Fall term. Credit three hours. Intended primarily for departmental majors. Lectures, M W 8. Plant Science 37. Laboratory, M or T 2-4:30. Plant Science 15. Associate Professor Langhans.

An elementary course covering the principles and practices of growing ornamental plants in the garden, greenhouse, and home.

102. INTRODUCTION TO LANDSCAPE DESIGN

Fall or spring term. Credit three hours. Open to all students except department majors. Lectures, M W F 9. East Roberts 222. Mr. Dwelle.

A consideration of the principles of landscape design as applied to the small-residence property.

105. PRINCIPLES OF FLOWER ARRANGEMENT

Fall or spring term. Credit two hours. Enrollment limited to 18 students for each laboratory section. Fall term: Lecture, Th 9. Plant Science 37. Laboratory, W or Th 2-4:30, or Th 10-12:30. Plant Science 22. Spring term: Lecture, T 10. Plant Science 37. Laboratory, W 2-4:30 or Th 10-12:30 or Th 2-4:30. Plant Science 22. Associate Professor Fox.

A study of the care and handling of flowers, the factors affecting keeping quality, and the design principles involved in the use of flowers and related decorative materials.

423. ENVIRONMENT AND ORNAMENTAL PLANT GROWTH

Fall term. Credit four hours. Prerequisites, Course 215, Biological Sciences 240, Agronomy 200 (all may be taken concurrently with Course 423). Lectures,

M W F 9. Plant Science 37. Laboratory, M 2-4:30. Plant Science 37 and greenhouses. Professor J. G. Seeley.

A comprehensive study of the application of basic science to the culture of ornamental plants.

Plant Materials

210. TAXONOMY OF CULTIVATED PLANTS

Fall term. Credit four hours. Intended primarily for departmental majors. Prerequisite, Biological Sciences 103-104 or its equivalent. Lectures, W F 10. Plant Science 37. Laboratory, W F 2-4:30. Plant Science 29. Associate Professor Ingram.

A study of the kinds of cultivated ferns and seed plants and their classification into families and genera. Emphasis is placed on methods of identification, the preparation and use of the analytical keys, the distinguishing characteristics of the families concerned, and their importance in ornamental horticulture.

212. HERBACEOUS PLANT MATERIALS

Spring term. Credit three hours. Prerequisite, Course 210 or permission to register. Lectures, T Th 8. Plant Science 143. Laboratory, W 2-4:30. Plant Science 15. Associate Professor Lee.

A study of the ornamental herbaceous plants used in landscape and garden plantings. Emphasis is placed on the identification, use, and culture of bulbs, annuals, and perennials.

213. WOODY-PLANT MATERIALS

Spring term. Credit four hours. Prerequisite, Course 210 or permission to register. Lectures, T Th 9. Plant Science 37. Laboratory and field trips, M and W or F 2-4:30. Plant Science 29. Assistant Professor Mower.

A study of the trees, shrubs, and vines used in landscape planting. Emphasis is placed on their characteristics and values for use as landscape material. The class visits Rochester parks.

313. WOODY-PLANT MATERIALS, ADVANCED COURSE

Fall term. Credit two hours. Prerequisite, Course 213. Lecture to be arranged. Laboratory, F 2-4:30. Plant Science 15. Assistant Professor Mower.

The important groups of landscape materials and the literature of the subject. A knowledge of the ordinary woody plants for landscape use in the Northeast is presumed. Emphasis is on less-known northern plants and upon plant groups basic in landscape design in other regions of the United States. Opportunities for practice in the determination of unknowns and in the use of the literature are provided. A trip is taken to Washington, D.C., and vicinity.

Nursery Management

215. PLANT PROPAGATION

Fall term. Credit three hours. Prerequisite, Biological Sciences 240 or the equivalent, or permission of the instructor. Lectures, T Th 8. Plant Science 37. Laboratory, Th 2-4:30. Greenhouses and nurseries. Associate Professor Tukey.

The germination of seeds, rooting of cuttings, multiplication of bulbs, and

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propagation of plants by budding and grafting are studied from the standpoint of the basic mechanisms governing the initiation and development of roots and shoots, including the physiology of dormancy, growth regulators, and germination. Field trips are taken to view commercial plant propagation techniques.

314. TURFGRASS MANAGEMENT

Spring term. Credit two hours. Prerequisite, Agronomy 200 or permission to register. Lecture, W 11. Plant Science 37. Laboratory, Th 2-4:30. Plant Science 29. Professor Cornman.

The principles, practices, and materials for the construction and maintenance of lawn areas. Some attention is given sports turf. A week-end inspection trip is taken to experimental test plots and special turf areas.

317. NURSERY CROP PRODUCTION AND MAINTENANCE

Spring term. Credit four hours. Given in alternate years. Prerequisite, Course 215. Lectures, M W F 8. Plant Science 37. Laboratory, M 2-4:30. Greenhouses and nursery. Professor Pridham.

The problems of commercial propagation and growing of nursery plants to marketable stage. Digging, storage, and packaging of nursery stock, and commercial planting and maintenance practices are included. Plant growth is considered in relation to soil and climate factors of site. Control of growth by watering, cultivation, and pruning of landscape plants in garden and park planting is stressed. Field problems and observational trips are included in laboratory work.

Commercial Floriculture

325. FLOWER-STORE MANAGEMENT

Spring term. Credit three hours. Prerequisites, Course 105 and permission to register. Lecture, T Th 8. Plant Science 37. Laboratory, T 2-4:30. Plant Science 22. Associate Professor Fox.

Lectures devoted to flower-shop management, business methods, merchandising, and marketing of floricultural commodities. Laboratories to include the application of subject matter and the principles of commercial floral arrangement and design. A required two-day field trip is made to flower shows and to wholesale and retail florist establishments.

424. FLORIST CROP PRODUCTION

Spring term. Credit four hours. Prerequisite, Course 423. Lectures, M W F 9. Plant Science 37. Laboratory, W 2-4:30. Greenhouses. Associate Professor Boodley.

The commercial production of florist crops. Emphasis is on culture of plants as influenced by greenhouse environment. Field trips are made to commercial greenhouses.

Landscape Service

The landscape service curriculum leads to the Bachelor of Science degree.

103. ELEMENTARY LANDSCAPE DESIGN

Fall term. Credit three hours. Prerequisite, Drawing 109 or 111. Intended

primarily for departmental majors. Lectures, T Th 11. Laboratory, Th 2-4:30. Plant Science 433. Associate Professor Scannell.

Principles of design, with practice in the use of drawing instruments and graphic interpretation of ideas.

232. INTERMEDIATE LANDSCAPE DESIGN

Spring term. Credit three hours. Prerequisites, Courses 103, 212 and 213 and Drawing 110. Lecture, M 11. Laboratory, T Th 10-12:30. Plant Science 433. Mr. Dwelle.

The application of the principles of design to the specific problems of the small residential property. A terminal course for those not intending to major in this field.

332. PLANTING DESIGN

Fall term. Credit three hours. Prerequisite, Course 232. Lecture, W 12. Laboratories, W 2-4:30 and F 10-12:30. Plant Science 433. Associate Professor Scannell.

An advanced course in design, with emphasis on plant combinations and uses in association with structures and gardens. Practice in drawing and estimating planting plans.

333. ADVANCED LANDSCAPE DESIGN

Spring term. Credit four hours. Prerequisite, Course 232. Lecture, M 12. Laboratory, M W 2-4:30 and one additional period. Plant Science 433. Associate Professor Scannell.

Practice in making landscape plans for real situations is an essential part of this course. Residential housing, industrial, and commercial landscape treatments are included.

341. NURSERY-LANDSCAPE CONSTRUCTION

Fall term. Credit three hours. Prerequisite, Agricultural Engineering 222. Lectures and laboratory, T Th 8-11. Plant Science 433. Mr. Dwelle.

Particular emphasis on principles of earth work, drainage, and the construction of small structures. Practice in interpreting and drawing construction details and the reading and drawing of grading plans.

342. ADVANCED NURSERY-LANDSCAPE CONSTRUCTION

Spring term. Credit two hours. Prerequisite, Course 341. Lecture and laboratory, W F 10-12:30. Plant Science 433. Associate Professor Scannell.

Preparing grading and drainage plans. Practice in preparing and reading dimension plans. Details of cost estimating.

Departmental Seminar

550. SPECIAL PROBLEMS IN FLORICULTURE AND ORNAMENTAL HORTICULTURE

Fall or spring term. Credit one or more hours. Prerequisite, adequate training for the work and permission to register. Professor J. G. Seeley and staff.

Special work on problems under investigation by the department or of special interest to the student, provided adequate facilities are available. Students must satisfy the staff member under whom the work is to be taken that their preparation warrants their choice of problems.

600. SEMINAR

For departmental staff and graduate students. Fall and spring terms. Time to be arranged, usually Tuesday noon.

Freehand Drawing and Illustration

Course descriptions are given on page 91.

FOOD SCIENCE

This department offers a curriculum leading to a Bachelor of Science degree with a specialization in dairy and food science. The curriculum includes a core of basic courses plus electives chosen to meet the specialized interest of the student. Elective courses can be chosen in chemical, physical or engineering sciences for those planning careers in research or teaching; or in business and accounting for those interested in managerial work.

Students interested in managerial work can combine a regular four-year program with a graduate program by qualifying for the combination program in the Cornell Graduate School of Business and Public Administration. This is a five-year program which permits the student to obtain a Bachelor of Science degree at the end of the senior year and a Master of Business Administration at the end of the fifth year. The curriculum also provides opportunity for the science-minded student to prepare for graduate work in either dairy or food science.

(Some of the following courses were previously listed under Dairy Science and some under Food Science.)

100. INTRODUCTORY FOOD SCIENCE

Fall term. Credit three hours. Lectures, M W F 10. Stocking 218. Assistant Professor Ledford.

Deals with the field of food science, including milk and milk products. Discussion of the principles of various methods of food processing. Economic, engineering, sanitary, and nutritional considerations are studied.

210. PROPERTIES, STANDARDS AND ANALYSIS OF FOODS

Spring term. Credit three hours. Prerequisite, Chemistry 104 or 108. Lectures, T Th 12. Stocking 218. Laboratory, F 2-4:30. Stocking 209. Professor Shipe and assistants.

The lecture portion of the course is divided into two parts. The first part deals with the general properties of fats, proteins, carbohydrates, minerals, and vitamins. The second part deals with the specific characterization of the constituents of foods. Food standards and methods of analysis are discussed. The laboratory portion of the course is designed to acquaint the student with a variety of qualitative and quantitative tests used by the food analyst.

225. PHYSICAL AND CHEMICAL PROPERTIES OF MEATS, EGGS, AND FISH AS RELATED TO MARKETING

Spring term. Credit three hours. Lectures, T Th 10. Laboratory, T or Th 2-4:30. Morrison 82. Professor Baker and Associate Professor Stouffer.

Intended for students who plan a career in marketing. The course deals with the handling of red meat and poultry meat following slaughter. The care of eggs and fish will also be included. Composition, microbiology, rancidity, color, flavor, and grades will be discussed. The course will also include packaging, preservation of new products and merchandising meat, poultry, eggs, and fish.

302. DAIRY AND FOOD ENGINEERING

Fall term. Credit four hours. Given in alternate years. Prerequisites, Physics 101 and 102 or the equivalent and Course 100. Lectures, M W F 10. Laboratory, M 2-4:30. Stocking 119. Professor Jordan.

Engineering aspects of dairy and food plant operations.

303. FATS AND OILS

Fall term. Credit three hours. Open to upperclassmen and graduate students. Lecture demonstrations, W F 11. Stocking 120. Laboratory practice, F 1:40-4:30. Stocking 209. Professor Krukovsky.

Certain phases of chemistry and quantitative analysis as applied to the quality control and improvement in the palatability and nutritional values of milk and other fat-containing food products, including the influence of the plant and animal.

[304. DAIRY ADMINISTRATION]

Fall term. Credit two hours. Given in alternate years. Prerequisite, Course 314. Lecture, Th 12. Laboratory, Th 2-4:30. Mr. Hoefer.] Not given in 1966-1967.

A study of dairy plant forms and records used in inventory control and the preparation of Market Administrator reports.

310. SENSORY QUALITIES AND EVALUATIONS OF FOODS

Spring term. Credit two hours. T Th 8:30-9:50. Stocking 120. Professor Shipe and assistants.

Deals with the factors affecting the color, odor, flavor, and texture of foods and the evaluation of these qualities. The techniques and interpretations of both objective and subjective evaluations are discussed. The laboratory exercises involve the evaluation of a variety of foods.

311. CONCENTRATION AND FREEZING PROCESSES

Spring term. Credit four hours. Given in alternate years. Lectures, M W 11-12:50. Laboratory, M 1:40-4:30. Stocking 120. Professor Jordan.

The principles and practice of condensing, drying, and freezing food products.

313. STERILIZATION PROCESSES

Spring term. Credit three hours. Given in alternate years. Prerequisites, Chemistry 353 or equivalent, Biological Sciences 394, and Physics 102. Recommended, a course in calculus and a course in biochemistry. Lectures, M W 10. Discussion, F 10. Riley-Robb 225. Laboratory, W 2-4. Riley-Robb 44. Professor Buck.

The principles of food preservation and the fundamentals of food processing from raw materials to finished product. Heat transfer, unit operations and unit processes employed by the canning industry will be emphasized, but sterilization by any means such as heat, chemicals, physical destruction, and filtration will be demonstrated. The effects of lethal energy treatment of biological fluids and systems on desirable components such as nutritive factors and flavor components will be considered along with the cost of operation. The laboratory involves actual participation in plant operations in the processing and preservation of various food products, and field trips.

[314. MILK AND FOOD SANITATION AND PLANT OPERATIONS]

Spring term. Credit four hours. Given in alternate years. Prerequisites, Course 100 and Biological Sciences 394. Lectures, M W 11-12:50. Laboratory, M 1:40-4:30. Professor White and assistants.] Not given in 1966-1967.

The biological and chemical control of milk and food processing. Federal, State, and local requirements for the production, collection, and processing of milk and food. The control of sanitation, composition, and production in the food plant is outlined with special attention given to the fluid milk industry.

[APPLIED AND INDUSTRIAL MICROBIOLOGY. (BIOLOGICAL SCIENCES 393.)]

Not given in 1966-1967.

DAIRY AND FOOD MICROBIOLOGY. (BIOLOGICAL SCIENCES 394.)

400. RESEARCH

Fall or spring term. Credit one or more hours by arrangement. Registration by permission only. Staff.

Special problems in any phase of food science may be elected.

[401. FOOD FROM FERMENTATIONS

Fall term. Credit five hours. Given in alternate years. Prerequisites, Courses 100, 210, dairy and food microbiology and organic chemistry or biochemistry. Lectures and laboratories, T Th 11-12:50 and 1:40-4:30. Professor Kosikowski and Assistant Professor Ledford.] Not given in 1966-1967.

The chemistry, microbiology, and technology of fermentations leading to important foods. Emphasis is placed on milk and cheese fermentations but consideration is given to fermentations resulting in major foods from all plant and animal sources.

Line-flow processing and testing practices designed to acquaint the student with principles are carried out in laboratory.

[403. INTERNATIONAL FOOD DEVELOPMENT

Fall term. Credit three hours. Given in alternate years. Permission of instructor required. M W 2-4. Professor Kosikowski.] Not given in 1966-1967.

A study of programs, technical problems, and progress associated with developing acceptable milk and food supplies in critical world areas. Proposals for increasing world protein resources for the human are to be discussed. Special attention is to be directed to the organization, operations, relationships, and contributions of U. N. technical agencies, FAO, UNICEF, WHO, and governmental and non-governmental organizations in the field.

404. CHEMISTRY OF MILK

Fall term. Credit three hours. Given in alternate years. Prerequisites, qualitative and quantitative analysis and organic chemistry. Hours by arrangement. Stocking 120. Assistant Professor Ledford.

A study of milk constituents and physical properties. Deals with milk enzymes, lactose, milk fat, milk proteins, and minor constituents.

410. FOOD BIOCHEMISTRY

Spring term. Credit three hours. Prerequisite, Biological Sciences 431. Lectures, M W F 11. Warren 131. Associate Professor Shallenberger and staff members from the Department of Food Science and Technology, New York State Agricultural Experiment Station, Geneva, New York.

A discussion of some of the important non-microbial changes in foods, such as denaturation and the Maillard browning reaction. Emphasis is placed on the occurrence, significance, and prevention or control of the changes as they affect the color, odor, flavor, texture, or nutritive value of foods.

411. FOOD PROCESSING INSTRUMENTATION

Spring term. Credit three hours. Given in alternate years. Prerequisite, Course 302. Lectures, M W 9. Riley-Robb 225. Laboratory, F 2-4:30. Riley-Robb 146.

Principles of engineering analysis and judgment are employed in examination of instruments for measurement and control of food processes. Topics include pressure, temperature, and flow measurements, plus selected instruments for measuring physical and chemical properties of foods. Electronic components of electrical instruments are discussed. The use of instruments in the enforcement of food laws is also presented.

413. ANALYTICAL METHODS

Spring term. Credit four hours. Given in alternate years. Prerequisites, Course 210, one term of either organic chemistry or biochemistry. Lectures, T Th 11. Stocking 119. Laboratory, Th 1-5. Stocking 209. Assistant Professor Sherbon.

A study of the analytical methods important to the food industry. The emphasis is on understanding the basic analytical chemistry applied in the various tests. General topics include sampling, gravimetric and volumetric methods, optical methods, electrochemistry, and the use of basic statistics.

420. UNDERGRADUATE SEMINAR

Fall term. Credit one or two hours. Time to be arranged.

Informal discussion of selected topics pertaining to dairy and food science.

[512. INSTRUMENTAL METHODS

Spring term. Credit five hours. Given in alternate years. Prerequisite, Course 413 or permission of the instructor. Assistant Professor Sherbon.] Not given in 1966-1967.

Deals with instrumental methods widely used in research and industry. The major emphasis is on chromatographic methods, spectroscopy, electrophoresis, and the use of computers in agricultural research. The stress will be on the practical use of the material presented.

[514. THE BIOCOLLOIDAL CHEMISTRY OF FOODS

Spring term. Credit three hours. Given in alternate years. Prerequisites, Biological Sciences 431 and 433, or the equivalent. Lectures, M W 10. Discussion, F 2. Laboratory, W 2-4. Professor Buck.] Not given in 1966-1967.

The principles of the science of colloidal systems and micelles of importance in biology and agriculture will be introduced; then the amiscropic morphology of cytoplasm, cell walls, plastids, biological gels, and sols will be studied and the data applied to food. Polysaccharides and polypeptides in chain molecules which sometimes reach microscopical lengths, will be intensively studied. Especial attention will be given to the structural arrangement of complex polymers. The physical chemistry of surfaces (including adsorption, ion-exchange and electric double layer), flocculation, viscosity, swelling, and gel formation will be discussed.

600. SEMINAR

Fall and spring terms. One hour credit may be allowed for those presenting seminars. Required of graduate students in the Department. Upperclassmen welcome. Time to be arranged. Stocking.

MEAT AND MEAT PRODUCTS. (ANIMAL SCIENCE 290.)

MEAT CUTTING. (ANIMAL SCIENCE 293.)

MEAT SELECTION AND GRADING. (ANIMAL SCIENCE 394.)

MEAT TECHNOLOGY. (ANIMAL SCIENCE 490.)

POST HARVEST PHYSIOLOGY, HANDLING, AND STORAGE OF FRUITS. (POMOLOGY 201.)

POULTRY MEAT AND EGG TECHNOLOGY. (POULTRY SCIENCE 450.)

VEGETABLE DISTRIBUTION, PROCESSING AND QUALITY MEASUREMENT. (VEGETABLE CROPS 212.)

POTATO PRODUCTION AND PROCESSING. (VEGETABLE CROPS 222.)

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VEGETABLE DISTRIBUTION, PROCESSING AND QUALITY MEASUREMENT, ADVANCED COURSE. (VEGETABLE CROPS 412.)

MARKETING. (AGRICULTURAL ECONOMICS 240.)

PRICING AND DISTRIBUTION OF MARKET MILK. (AGRICULTURAL ECONOMICS 346.)

FOOD DISTRIBUTION. (AGRICULTURAL ECONOMICS 441.)

SPECIAL TOPICS IN FOOD DISTRIBUTION. (AGRICULTURAL ECONOMICS 442.)

FOOD INDUSTRY MANAGEMENT. (AGRICULTURAL ECONOMICS 443.)

SPECIAL TOPICS IN FOOD INDUSTRY MANAGEMENT. (AGRICULTURAL ECONOMICS 444.)

FIELD STUDY OF FOOD INDUSTRIES. (AGRICULTURAL ECONOMICS 445.)

INTERNATIONAL AGRICULTURE

600. SEMINAR: INTERNATIONAL AGRICULTURAL DEVELOPMENT
Fall and spring terms. No credit. Third and fourth Wednesdays 4:30-5:30.
Plant Science 404. Professor Turk and staff.

Primarily for graduate students interested in an integrated view of problems related to international agricultural development. Undergraduates with a specialization in International Agriculture are encouraged to attend without registering. The seminar will focus on developing an understanding of the nature and interrelatedness to agricultural development of the social sciences, plant and animal sciences, foods and nutrition, and natural resources.

ECONOMICS OF AGRICULTURAL DEVELOPMENT. (AGRICULTURAL ECONOMICS 364.)

ECONOMIC ASPECTS OF THE WORLD'S FOOD. (AGRICULTURAL ECONOMICS 560.)

SEMINAR ON AGRICULTURAL POLICY. (AGRICULTURAL ECONOMICS 651.)

SEMINAR ON THE AGRICULTURAL DEVELOPMENT OF SOUTH ASIA. (AGRICULTURAL ECONOMICS 664.)

SEMINAR ON LATIN AMERICAN AGRICULTURAL POLICY. (AGRICULTURAL ECONOMICS 665.)

SEMINAR ON THE ECONOMICS OF TROPICAL AGRICULTURE. (AGRICULTURAL ECONOMICS 667.)

SEMINAR IN THE ECONOMICS OF AGRICULTURAL DEVELOPMENT. (AGRICULTURAL ECONOMICS 668.)

LOW-COST ROADS. (AGRICULTURAL ENGINEERING 491.)

IDENTIFICATION, APPRAISAL AND GEOGRAPHY OF SOILS. (AGRONOMY 301.)

GEOGRAPHY AND APPRAISAL OF SOILS OF THE TROPICS. (AGRONOMY 401.)

TROPICAL AGRICULTURE. (AGRONOMY 422.)

ECONOMIC CROPS OF THE WORLD, THEIR NATURE, PROPERTIES, PRODUCTS AND USE. (AGRONOMY 425.)

LIVESTOCK PRODUCTION IN THE TROPICS. (ANIMAL SCIENCE 400.)

INTERNATIONAL FOOD DEVELOPMENT. (FOOD SCIENCE 403.)

INTRODUCTORY PARASITOLOGY. (ENTOMOLOGY 351.)

ADVANCED PARASITOLOGY. (MEDICAL ENTOMOLOGY.) (ENTOMOLOGY 552.)

INTERNATIONAL COMMUNICATION. (EXTENSION TEACHING 501.)

PROBLEMS AND PROGRAMS IN INTERNATIONAL NUTRITION
(See *Announcement of School of Nutrition.*)

SEMINAR IN FOOD AND POPULATION
(See *Announcement of School of Nutrition.*)

PRINCIPLES OF SEED PRODUCTION, TECHNOLOGY AND DISTRIBUTION. (PLANT BREEDING 506.)

ECONOMIC FRUITS OF THE WORLD. (POMOLOGY 301.)

PRINCIPLES OF EXTENSION EDUCATION PROGRAMING AND TEACHING. (RURAL EDUCATION 524.)

COMMUNICATION IN EXTENSION AND COMMUNITY DEVELOPMENT PROGRAMS. (RURAL EDUCATION 525.)

SEMINARS: COMPARATIVE EXTENSION EDUCATION SYSTEMS. (RURAL EDUCATION 626.)

SEMINAR: IMPLEMENTING EXTENSION AND COMMUNITY DEVELOPMENT PROGRAMS IN DEVELOPING COUNTRIES. (RURAL EDUCATION 627.)

RURAL SOCIAL SYSTEMS. (RURAL SOCIOLOGY 412.)

LATIN AMERICAN SOCIETIES IN TRANSITION. (RURAL SOCIOLOGY 414.)

COMPARATIVE RURAL SOCIETIES. (RURAL SOCIOLOGY 420.)

CROSS-CULTURAL RESEARCH METHODS. (RURAL SOCIOLOGY 516.)

APPLICATIONS OF SOCIOLOGY TO DEVELOPMENT PROGRAMS. (RURAL SOCIOLOGY 528.)

CONTEMPORARY THEORIES OF SOCIAL CHANGE. (RURAL SOCIOLOGY 530.)

SPECIAL TOPICS IN PLANT SCIENCE EXTENSION. (VEGETABLE CROPS 429.)

METEOROLOGY

201. BASIC PRINCIPLES OF METEOROLOGY

Fall term. Credit three hours. Prerequisite, Physics 101-102. Lectures, T Th 11. Plant Science 143. Laboratory, T W or Th 2-4:30. Plant Science 114. Associate Professor Dethier.

Simplified treatment of the structure of the atmosphere; heat balance of the earth; general and secondary circulations; air masses, fronts, and cyclones; hurricanes; thunderstorms, tornadoes, and atmospheric condensation. In the laboratory, emphasis is on the common meteorological instruments and the weather map.

202. CLIMATOLOGY

Spring term. Credit three hours. Prerequisite, Course 201. Lectures, M W F 11. Plant Science 141. Associate Professor Dethier.

The first ten weeks are devoted to the description of world climates in terms of the global distribution of radiation, temperature, pressure and wind, precipitation and air masses, and the factors which produce this distribution.

During the last five weeks of study, emphasis is on the factors influencing the microclimate and the variation of climate due to vegetation and small-scale topographic features.

[331. TROPICAL METEOROLOGY

Spring term. Credit three hours. Given in alternate years. Prerequisite. Course 201 or 411. Lectures, M W F 11. Plant Science 141. Associate Professor Dethier.] Not given in 1966-1967.

A study of the general circulation of the tropics, easterly waves, hurricanes, monsoons and local diurnal tropical weather phenomena.

[411. INTRODUCTORY DYNAMIC METEOROLOGY.

Fall term. Credit three hours. Given in alternate years. Prerequisites, Physics 207-208 and Mathematics 111-112 or permission of the instructor. Lectures, M W F 8. Plant Science 141. Associate Professor Covey.] Not given in 1966-1967.

Properties of air, hydrostatic stability and convection, radiation in the earth's weather system, and atmospheric circulations.

[412. INTERMEDIATE DYNAMIC METEOROLOGY

Spring term. Credit three hours. Given in alternate years. Prerequisites, Course 411 and Mathematics 213 or permission of instructor. Associate Professor Covey.] Not given in 1966-1967.

Consideration of the atmospheric part of the earth's weather system. Review of attempts to find the governing relations in useful form, and to identify, measure, and compute the significant parameters.

413. MICROMETEOROLOGY

Fall term. Credit three hours. Given in alternate years. Prerequisites, same as for Course 411. Associate Professor Covey.

Weather and climate near the ground, considered from the local point of view. Interaction of plants and their local physical environment.

550. SPECIAL TOPICS IN METEOROLOGY AND CLIMATOLOGY

Fall or spring term. Credit one or more hours. Prerequisite, permission of the instructor. Staff.

Study of meteorological topics more advanced than or different from those in other courses. Subject matter depends on the background and desires of those enrolling.

562. RESEARCH IN METEOROLOGY

Fall and spring terms. Credit one or more hours. Thesis research. Staff.

691. SEMINAR IN METEOROLOGY

Prerequisite, permission of the professor in charge. Topic for Spring 1967, "Interaction of Lands and Atmosphere in the Earth's Weather System." Associate Professor Covey.

Subjects for future times may be such things as hydrometeorology, paleoclimatology, atmospheric pollution. These will be planned and announced well in advance.

PLANT BREEDING

Four-year students interested in specializing in genetics, plant breeding, or statistics may obtain suggested sequences of courses by consulting the head of the department or other members of the faculty. Professional careers in these fields ordinarily involve advanced study. Therefore, undergraduate course work in most instances will be directed toward preparation for graduate study. Appropriate fundamental courses in biology, mathematics, chemistry, and English will make up the bulk of the curriculum. For those who plan to continue study at the graduate level, course work in a foreign language is required.

Plant Breeding

503. METHODS OF PLANT BREEDING

Fall term. Credit three hours. Primarily for graduate students, but open to properly qualified seniors who expect to engage in plant breeding. Prerequisites, Biological Sciences 101-102 or 103-104 and 281, and a course in at least one of the following: Field crops, vegetable crops, floriculture, or pomology. Lectures, T Th 8. Plant Science 141. Laboratory, T 2-4:30. Professor Munger.

A study of the principles and practices of plant breeding. Lectures, supplemented by periods in the greenhouse and experimental fields.

505. PLANT BREEDING-APPLIED METHODS AND TECHNIQUES

Spring term. Credit one hour. Prerequisites, same as for Course 503 or consent of the instructor. Laboratory, T 2-4:30. Plant Science 107. Associate Professor Crowder.

Designed to acquaint students with the field, greenhouse, and laboratory techniques used in plant breeding research. Will include experience in the planning and conduct of field experiments; also acquaintance with useful methods from related fields of agricultural research.

506. PRINCIPLES OF SEED PRODUCTION, TECHNOLOGY, AND DISTRIBUTION

Spring term. Credit two hours. Prerequisite, Course 503. Lecture and laboratory, M 8-10. Plant Science 107. Associate Professor Crowder.

Designed to develop an appreciation for the responsibilities related to seed production, processing and merchandising. Topics covered will include: geographical areas of seed increase, production methods as related to crop type, techniques involved in harvesting, cleaning and storing, various aspects of seed usage, movement through seed channels and relationships of seed improvement—local seed certification agencies, national

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and international organizations. Students will have an opportunity to become familiar with seed grading and identification. Three field trips will be taken.

512. EXPERIMENTAL METHODS

Spring term. Credit two hours. Prerequisite, Course 511 or consent of instructor. Lectures, M W F. Time to be arranged. Plant Science 141. Professor Lowe. (Not given in 1967-68.)

Use of statistical methods and application of experimental designs and plot techniques to problems in plant breeding and related agricultural research.

[515. STATISTICS FOR QUANTITATIVE GENETICS

Spring term. Credit two hours. Prerequisites, Courses 511 and 503 or their equivalents. Lectures, T Th 8. Plant Science 141. Professor Plaisted.] Not given in 1966-67.

An introduction to statistical methods currently used in research in quantitative genetics and plant breeding.

519. STATISTICAL GENETICS

Spring term. Credit three hours. Prerequisites, Course 514 and Mathematics 371. Time and place of lectures to be announced. Professor Robson.

An introduction and application of the theory of Markov chains to mating systems including selfing, sibbing, backcrossing and random mating, with a discussion of genetic variance component analysis and Monte Carlo simulation of such systems on high-speed computers.

SPECIAL TOPICS IN PLANT SCIENCE EXTENSION. (VEGETABLE CROPS 429.)

Departmental Seminar and Research

450. SPECIAL PROBLEMS IN RESEARCH

Fall, spring, or summer. Credit one or more hours by arrangement with instructor. Prerequisite, permission to register. Members of the departmental staff.

622. SEMINAR

Fall and spring terms. Without credit. Time and place to be announced. Members of the departmental staff.

Seminars of specific interest to the areas of genetics, plant breeding, and biometrics meet separately each week.

Genetics

HUMAN GENETICS. (BIOLOGICAL SCIENCES 280.)

GENETICS. (BIOLOGICAL SCIENCES 281.)

POPULATION GENETICS. (BIOLOGICAL SCIENCES 480.)

PHYSIOLOGICAL GENETICS. (BIOLOGICAL SCIENCES 482.)

PLANT PATHOLOGY

The department offers programs of instruction in plant pathology, mycology, plant nematology, and plant virology. Undergraduate programs

are developed for students planning careers in state or federal regulatory work, in technical service, in agricultural chemical sales, as county agents, in farm advisory services, as laboratory technicians, or in other agricultural positions.

Programs for those interested in teaching or research in these areas are offered at the graduate level. Undergraduates aiming toward such programs are advised to take the general biological sciences curriculum with emphasis on the plant sciences.

301. ELEMENTARY PLANT PATHOLOGY

Every fall and alternate spring terms. Credit three hours. Prerequisite, Biological Sciences 101-102 or 103-104, or the equivalent. Lecture, T Th 11. Plant Science 37. Laboratory, T W Th or F 2-4:30. Plant Science 341. Conferences to be arranged. Professor Boothroyd.

An introductory course dealing with the nature, cause, and control of disease in plants. Representative diseases of cultivated crops are studied in the laboratory.

[302. PLANT DISEASE CONTROL PRACTICES

Spring term. Credit three hours. Given in alternate years. Prerequisite, Course 301 or equivalent. Lecture, T 11. Plant Science 336. Laboratories and recitation, T Th 2-4:30. Plant Science 342. Professor L. J. Tyler.] Not given in 1966-1967.

For undergraduates who expect to engage in general farming, fruit, vegetable, cereal, or ornamental growing, in agricultural agent work, or in teaching of agriculture in secondary schools. Consideration is given to modern methods for controlling diseases of plants through production and use of disease-free propagative materials, seed treatments, regulatory laws, crop rotation, plant surgery, sanitation, soil treatment, spraying and dusting, and development and use of disease resistant varieties. Field trips arranged to observe disease control practices.

[309. COMPARATIVE MORPHOLOGY OF FUNGI

Spring term. Credit four hours. Given in alternate years. Prerequisite, a year sequence of Botany or its equivalent, and permission to register. Lecture, M W 9. Plant Science 336. Laboratory, M W 1:40-4:30. Plant Science 326. Professor Korf.] Not given in 1966-1967.

An introductory course in mycology. Emphasis is placed on morphology rather than on taxonomy.

[401. BIOLOGICAL ASPECTS OF PLANT DISEASE

Spring term. Credit four hours. Given in alternate years. Prerequisites, Biological Sciences 101-102 or 103-104 or the equivalent, introductory chemistry and permission to register. Primarily for juniors and seniors. Lecture, T Th 11. Plant Science 37. Laboratory, T Th 2-4:30. Plant Science 341. Associate Professor Millar.] Not given in 1966-1967.

A course to integrate concepts and knowledge of several biological sciences. Etiological, cytological, physiological, biochemical, genetical, ecological, entomological, epidemiological and sociological aspects of disease will be considered in terms of the interactions of a variety of organisms.

403. PATHOLOGY OF TREES AND SHRUBS

Spring term. Credit three hours. Prerequisite, Course 301 or the equivalent. Lecture, W F 10. Plant Science 336. Laboratory, F 1:40-4:30. Plant Science 343. Assistant Professor Sinclair.

For students desiring some specialized knowledge of diseases of trees and shrubs in preparation for nursery or landscape work, for careers as park superintendents, arborists, or city foresters, or for other horticultural profes-

sions; dealing with the nature, recognition, diagnosis, and treatment of diseases of woody plants.

431. UNDERGRADUATE RESEARCH IN MYCOLOGY OR PLANT PATHOLOGY

Fall or spring term or both. Credit three to five hours. Registration by permission. Not less than three laboratories of three clock hours each per week. Staff members.

Designed to afford opportunity for selected undergraduates to test their inclinations and ability to do research work. The student is expected to prosecute with interest and enthusiasm, under informal direction of the professor, some problem or problems mutually agreed upon.

501. ADVANCED PLANT PATHOLOGY

Fall term. Credit four hours. Prerequisite, a course in introductory plant pathology and permission to register. Lecture, T Th 11. Plant Science 336. Laboratory, T Th or W F 2-4:30. Plant Science 342. Associate Professor Millar.

Designed to acquaint the student with the basic principles and techniques of the science of phytopathology and to provide an adequate foundation for successful prosecution of research in this field.

502. PRINCIPLES OF PLANT DISEASE CONTROL

Spring term. Credit three hours. Given in alternate years. Graduate students only. Enrollment limited to 24. Prerequisite, Course 501 or its equivalent and permission to register. Lecture, T 11. Plant Science 336. Laboratory and discussion, T Th 2-4:30. Plant Science 342. Professor L. J. Tyler.

For graduate students who expect to teach and/or perform research in educational institutions, experiment stations, or agricultural chemical companies in connection with the development and use of plant disease control materials and methods. Emphasis is placed upon the philosophies underlying the four principles of plant disease control: exclusion, eradication, protection, and immunization. Attention is given to the existing body of knowledge upon which present disease control practices are based. Objectives are to help the student interested in plant protection equip himself not only to apply existing methods and materials but to enable him to improve upon them by developing new ideas, etc., especially in situations where control of plant diseases requires new approaches.

505. PLANT VIROLOGY

Fall term. Credit three hours; in special cases, permission may be obtained to enroll for lectures only (two hours credit). For graduate students with majors or minors in plant pathology and, in special cases, to other graduate students interested in virology. Prerequisite, Course 501 or permission to register. Lecture, T Th 10. Plant Science 336. Laboratory, F 1:40-4:30. Plant Science Greenhouse. Professor Ross.

Designed to provide advanced graduate students with basic information on the nature and properties of plant viruses and on the diseases they cause.

[506. PLANT NEMATOLOGY

Spring term. Credit three or five hours. Given in alternate years. For graduate students with majors or minors in plant pathology and, in special cases, other students interested in nematology. Prerequisite, Course 501 or permission to register. Two lectures and one or two three-hour morning laboratory periods per week. Hours to be arranged. Lectures, Plant Science 336. Laboratory, Virology-Nematology Laboratory. Professor Mai.] Not given in 1966-67.

Anatomy, morphology, and taxonomy of plant parasitic forms and non-

parasitic soil-inhabiting forms of nematodes are studied. Plant pathogenic forms also are considered from the standpoint of host-pathogen relationships, host ranges, life cycles, and the symptoms they cause. Principles and methods of control are discussed.

507. BACTERIAL PLANT PATHOGENS

Spring term. Credit two hours. Given in alternate years. For graduate students with majors or minors in plant pathology; others by permission only. Prerequisite, Course 501 or permission to register. Lecture, F 9. Plant Science 336. Laboratory, F 2-4:30. Plant Science 304. Associate Professor Dickey.

Designed to provide students with basic information on bacterial plant diseases and phytopathogenic bacteria. The laboratory will include some of the more important techniques used in the study of bacterial plant pathogens.

[508. DISEASE AND PATHOGEN PHYSIOLOGY

Fall term. Credit three hours. Given in alternate years. For graduate students with majors or minors in plant pathology; others by permission only. Prerequisites, Course 501, Biological Sciences 433 and 544, and permission to register. Lecture, F 9. Plant Science 336. Laboratory, F 1:40-4:30 and one to be arranged. Plant Science 344. Associate Professor Bateman.] Not given in 1966-1967.

Designed to provide students with insight into the mechanisms of pathogenesis and altered metabolism of diseased plants.

531. SPECIAL PROBLEMS IN MYCOLOGY OR PLANT PATHOLOGY

Fall or spring term, or both. Credit three or five hours each term. For graduate students only. Registration by permission. Three to five weekly laboratory periods of three hours each. Staff members.

For work in mycology, modern techniques and the experimental approach are stressed, in areas such as physiology, developmental morphology, genetic systems, or cytotaxonomy.

For work in plant pathology for minor thesis or problems, or for students wishing to develop familiarity with modern techniques in some phase of the science.

541. PHILOSOPHY OF PLANT PATHOLOGY

Fall term. Credit two hours. Designed for Ph.D. students majoring in plant pathology. Prerequisites, Courses 501, 529, and at least two other courses from 502, 505, 506, 507, and 508, or permission to register. Conferences, M W 8-10. Plant Science 422. Professor Kent.

A conference with advanced graduate students examining the concepts of plant pathology as they relate to the approach to basic and applied research problems, teaching, and extension.

549. ADVANCED MYCOLOGY

Fall term. Credit five hours. Given in alternate years. Prerequisites, Course 309 or its equivalent, a course in genetics, and permission of the professor to register. Lecture, M W 9. Plant Science 336. Laboratory, M W F 1:40-4:30. Plant Science 326. Professor Korf.

Part of a two-course sequence (549 and 559) designed especially for students specializing in mycology or plant pathology. Reading knowledge of scientific French and German is *strongly* recommended. Emphasis is placed on taxonomy and the mechanisms of variation in fungi, but other aspects of mycology are embraced. Practice in identification of specimens is stressed in various groups, as is critical evaluation of keys and monographs. Field work is *required*. Basidiomycetes and Phycomycetes are covered in detail.

559. ADVANCED MYCOLOGY

Spring term. Credit five hours. Given in alternate years. Prerequisites, Course 549 or its equivalent and permission of the professor to register. Lecture, M W 9. Plant Science 336. Laboratory, M W F 1:40-4:30. Plant Science 326. Professor Korf.

Part of a two-course sequence (549 and 559) described above. Fungi Imperfecti and Ascomycetes are covered in detail.

645-654. CURRENT TOPICS

Fall and spring terms. Credit to be arranged. For graduate students with special interests in the particular area. Prerequisite, permission to register. Time to be arranged. Plant Science 422.

Weekly discussions of current topics in special areas of plant pathology and mycology. Students will be required to do extensive reading of current literature and to present oral and written reports.

645. PLANT VIROLOGY

Professors Ross and Rochow.

646. PLANT NEMATOLOGY

Professor Mai and Associate Professor Harrison.

647. BACTERIAL PLANT PATHOGENS

Associate Professor Dickey.

648. PHYSIOLOGY OF PLANT DISEASES

Associate Professor Bateman and Associate Professor Millar.

649. MYCOLOGY

Professor Korf.

650. DISEASES OF VEGETABLE CROPS

Professor Sherf, Associate Professor Wilkinson, and Assistant Professor Lorbeer.

653. PATHOLOGY OF TREES AND SHRUBS

Assistant Professor Sinclair.

654. DISEASES OF FLORIST CROPS

Professor Dimock.

661. SEMINAR

Fall and spring terms. Credit one hour. Required of all graduate students taking work in the department. T 4:30-5:30. Plant Science Seminar Room. Professor Peterson.

671. PLANT PATHOLOGY COLLOQUIUM

Fall and spring terms. Credit one hour. First and third Thursdays 7:45-9:45 P.M. Plant Science Seminar Room. Staff and graduate students.

VIROLOGY. (BIOLOGICAL SCIENCES 498.)

POMOLOGY

Students who desire to do their major work in pomology may obtain a suggested sequence of courses for the four-year period by consulting the department.

GENERAL HORTICULTURE (See Vegetable Crops 103.)

Those who want a general course in horticulture covering flowers, fruits, and vegetables should take this course.

101. TREE FRUITS

Fall term. Credit three hours. Should be preceded or accompanied by an introductory course in biological science. Lectures, T Th 8. Warren 131. Laboratory, W 2-4:30. Plant Science 107. Professor Edgerton.

A study of the general principles and practices of tree-fruit culture and their relation to the underlying sciences. Topics to be covered include propagation, varieties, orchard management, and growth and fruiting habits. Practical work is presented in grafting, pruning, site and soil selection, and planting.

102. SMALL FRUITS

Fall term. Credit three hours. Should be preceded or accompanied by an introductory course in biological science. Lectures, M W 8. Plant Science 143. Laboratory, M 2-4:30. Plant Science 114. Associate Professor Tomkins.

A study of the general principles and practices in the culture of grapes, strawberries, brambles and bush fruits; and their relation to the underlying sciences. Fruiting and growth habits are covered, with practical work in pruning, planting, and propagation. One or two Saturday field trips will be taken.

201. POST-HARVEST PHYSIOLOGY, HANDLING, AND STORAGE OF FRUITS

Fall term. Credit three hours. Prerequisite, Course 101 or 102. Lectures, T Th 8. Plant Science 143. Laboratory, F 2-4:30. Plant Science 107. Professor Blampied.

The chemistry and physiology of fruits as they affect quality and marketability are studied. Handling methods, maturity indices, and storage practices are considered. Practical work involves grading and inspection of fruits and storage of fruit in different ways. One Saturday field trip is required.

202. ADVANCED LABORATORY COURSE

Spring term. Credit two hours. S 8-12. Plant Science 107. Professors Hoffman and Edgerton.

This course is designed to give more extended practice in the various orchard operations than can be given in Course 101. Special attention is given to problems of pruning, grafting, orchard-soil selection and management, pollination, and spray practice. One or two field trips extending into the afternoon are made.

[301. ECONOMIC FRUITS OF THE WORLD

Spring term. Credit three hours. Given in alternate years. Prerequisite, an introductory course in biological science, or permission to register. Lectures, M W 8. Plant Science 143. Laboratory, F 2-4:30. Plant Science 114. Professor Smock.] Not given in 1966-1967.

The more important subtropical and tropical fruit species such as citrus, banana, mango, coffee and cacao are dealt with. Morphology, physiology, and adaptation to climate are stressed rather than details of culture. A broad view of world pomology is given.

401. ADVANCED POMOLOGY

Fall term. Credit three hours. Given in alternate years. Prerequisites, Courses 101 and 102 and Biological Sciences 240. Lectures, M W F 8. Plant Science 114. Professor Hoffman.

A comprehensive study of the sources of knowledge and opinions as to practices in pomology. The results of experiences and research pertaining to pomology are discussed, with special reference to their application in the solution of problems in commercial fruit growing.

501. SPECIAL TOPICS IN EXPERIMENTAL POMOLOGY

Spring term. Credit three hours. Given in alternate years. Hours to be arranged. Professors Edgerton and Smock and Associate Professors Oberly and Powell.

The student is expected to review critically and to evaluate the more important original papers relating to various phases of pomological research. Recent experimental methods applicable to the topic are fully considered.

502. RESEARCH

Fall, spring, or both terms. Credit two or more hours a term. Prerequisite, Course 401. Professors Hoffman, Smock, and Edgerton, Associate Professors Blanpied, Oberly, Powell, and Tomkins and Assistant Professor Creasy.

600. SEMINAR

Fall and spring terms. Without credit. Required of students taking Course 502 and graduate students in pomology. T 11. Plant Science Seminar Room. Members of the departmental staff.

POULTRY SCIENCE

The poultry industry offers opportunities in all phases of production, distribution, technical service, research, and teaching. Individual preference and aptitudes should be considered in making a choice. Suggested sequences of courses are available to students interested in production or in a business allied to it, and to those interested in a career in research, teaching, or commercial work in such specialized biological science fields as genetics, nutrition, physiology, or food technology. Adequate high school preparation in mathematics, science, and English is very desirable, particularly for students interested in the latter fields.

100. INTRODUCTION TO POULTRY SCIENCE

Fall term. Credit three hours. Lectures, M W F 9. One recitation period, to be arranged. Rice 300. Professor Bruckner, assisted by other members of the staff.

A general course dealing with the principles of poultry production.

[121. BIOLOGY OF THE FOWL

Fall term. Credit three hours. Given in alternate years. Lectures, T Th 10. Laboratory, T 2-4:30. Rice 101. Professor Marble.] Not given in 1966-1967.

An elementary course in avian biology which starts with the hatching egg and traces the growth and physical changes within the living embryo, the immature, and the mature bird. Emphasis is on elementary breeding, selection for economic traits, breed classification and reproduction.

270. POULTRY HYGIENE AND DISEASE

Fall term. Credit two hours. Given in alternate years. Prerequisites, Biological Sciences 290 or 290A, and Veterinary Physiology 10. Th 2-4:30. Veterinary College. Dr. Spencer.

The nature of the infectious and parasitic diseases of poultry and the principles of hygiene applicable to poultry farming for the prevention and control of diseases.

280. POULTRY FARM MANAGEMENT

Spring term. Credit three hours. Lectures, T Th 10. Laboratory, W 2-4. Rice 101. Professor Marble.

Management of the hatchery, young stock, and laying flock. Practical and

business management problems of the hatcheryman and commercial poultryman will be studied. Field trips will be taken.

310. POULTRY NUTRITION

Spring term. Credit three hours. Prerequisite, chemistry and physiology or permission of instructor. Not open to freshmen. Lectures, M W F 8. Rice 101. Associate Professor Nesheim.

The principles of poultry nutrition and their application to poultry feeding and feed manufacturing.

390. POULTRY PROBLEMS

Fall or spring term. Credit, one, two, or three hours. Prerequisite, written permission of staff members concerned. Professor Bruckner.

Investigation of some problem in the field of poultry husbandry by the student under the direction of a member of the staff.

[420. POULTRY GENETICS

Spring term. Credit three hours. Given in alternate years. Open to juniors. Prerequisite, permission of instructor. Lectures, M W F 9. Rice 201. Professor Cole.] Not given in 1966-1967.

A survey of inherited characters in domestic birds, cytology, linkage, inbreeding, hybrid vigor, resistance to disease, genetic principles in poultry breeding, physiology of avian reproduction, infertility, embryonic mortality, and avian endocrinology.

425. COMPARATIVE PHYSIOLOGY OF REPRODUCTION OF VERTEBRATES

Spring term. Credit three hours. Prerequisites, Animal Science 427 and consent of the instructor. Lectures, M W 10. Laboratory to be arranged. Rice 300. Associate Professor van Tienhoven.

Sex and its manifestations, endocrinology of reproduction, interactions between endocrine and nervous systems. The laboratory will provide an opportunity for students to design and execute experiments, with limited objectives, independently.

[440. ANATOMY OF THE FOWL

Fall term. Credit three hours. Open to juniors. Given in alternate years. Prerequisites, Biological Sciences 102 or 104 and permission of the instructor. Lectures, T Th 8. Rice 201. Laboratory, F 2-4:15. Rice 101. Professor Cole.] Not given in 1966-1967.

The lectures, supplemented by laboratory periods for study and dissection, are designed to acquaint the student with the anatomy of the fowl.

450. POULTRY MEAT AND EGG TECHNOLOGY

Spring term. Credit three hours. Given in alternate years. Prerequisites, Chemistry 303, or its equivalent, and Biological Sciences 290. Lectures, T Th 9. Laboratory, M 2-4. Rice 101. Professor Baker.

A discussion and study of some of the important microbial and nonmicrobial changes in poultry meat and eggs as well as the chemical composition and preservation of these products. Development of new products is also emphasized.

PHYSICAL AND CHEMICAL PROPERTIES OF MEATS, EGGS, AND FISH AS RELATED TO MARKETING. (FOOD SCIENCE 225.)

511. RESEARCH IN NUTRITION

Fall or spring term. Credit and hours to be arranged. For graduate students only. Registration by permission of staff member concerned. Professors R. J. Young and M. L. Scott, Associate Professor Nesheim.

For students desiring experience in planning, conducting, and reporting independent research projects in poultry nutrition.

609. SEMINAR IN POULTRY BIOLOGY

Fall and spring terms. For graduate students. Th 4:15. Rice 300. Members of the departmental staff.

A survey of recent literature and research in poultry biology.

619. SEMINAR ON ANIMAL NUTRITION

Fall term. Credit one hour. Open to graduate students with major field of study in animal nutrition. Registration by permission. T 4:30. Morrison 348. Animal nutrition staff.

A critical review of the literature and other topics of special interest to graduate students in animal nutrition.

PROTEINS AND AMINO ACIDS. (FOOD & NUTRITION 501.)

LIPIDS AND CARBOHYDRATES. (ANIMAL SCIENCE 502.)

NUTRITIONAL ENERGETICS. (ANIMAL SCIENCE 503.)

MINERALS AND VITAMINS. (ANIMAL SCIENCE 504.)

RURAL EDUCATION

Program for the Preparation of Secondary-School Teachers *

With careful planning, it is possible to meet the requirements for a Bachelor of Science degree and, at the same time, the certification requirements for teaching. Therefore, students who desire to prepare for teaching science or agriculture should plan their programs with the appropriate adviser in science teaching, or in agricultural education.

Those planning to teach science in secondary schools should take Psychology (Rural Education 110 or Psychology 101) during their freshman or sophomore years. In the junior year they should take Educational Psychology (Rural Education 411) and Methods of Teaching Science in Secondary Schools (Rural Education 428). They complete the required courses in the senior year by registering for Practice in Teaching Science in Secondary Schools (Rural Education 429), and Social Foundations of Education (R.E. 470). Electives are chosen to complete the 18 hours of professional credit required for a provisional certificate. A permanent certificate requires an additional year.

Students planning to teach agriculture should have a conference with a member of the staff in agricultural education to ascertain the requirements in agriculture, science, and education. This should be done immediately after deciding to teach so as to avoid conflicts and delay in completing all of the requirements. The professional courses required are: Rural Education 331 in the junior year, Rural Education 411, 332, and 434 in the fall term of the senior year, and Rural Education 470 in the spring term of the senior year. A major portion of the work in the fall term of the senior year is student teaching in one of the rural high schools. Students enrolling in Rural Education 332 and 434 are required to report for course work and student teaching September 6, 1966.

* For other courses in education, consult the *Announcements of the Schools of Education and of Industrial and Labor Relations*, and of the *Colleges of Home Economics and Arts and Sciences*.

Independent study programs consisting of tutorial study are available to honors students preparing to teach agriculture. Information concerning tutorial study may be obtained in Room 205, Stone Hall.

Administration and Supervision

561. THEORY AND PRACTICE OF ADMINISTRATION

Fall term. Credit three hours. M W 2-3:15. Professor McCarty.

The goal of this course is to give a student understanding and practice in the use of behavioral science concepts for analyzing human behavior in formal organizations. Students will be required to apply course concepts to the analysis and discussion of cases. The course provides explicit instruction and practice in defining administrative problems; evaluating various kinds of evidence; exploring possible courses of action; making definite decisions, and setting forth programs of action to implement these decisions.

562. THE SECONDARY SCHOOL PRINCIPALSHIP

Spring term. Credit three hours. T Th S 10. Plant Science 141. Professor Hixon.

Critical analysis of problems of the secondary school principalship as related to function of the secondary school; its curriculum; appraisal of teaching and learning; pupil characteristics; patterns of organization of personnel and resources.

563. ELEMENTARY SCHOOL ADMINISTRATION

Spring term. Credit three hours. Given in alternate years. T Th 2-3:15. East Roberts 222. Assistant Professor Egner.

Organized to enable recognition and cognition of the administrative functions essential to an effective elementary school. Analysis will include the elementary school as a unique institution, innovation in organization and curriculum, administration of instructional and noninstructional personnel, and community relationships.

564. SCHOOL FINANCE AND FACILITIES

Spring term. Credit three hours. Prerequisite, Course 561 or equivalent.

The role of the administrator in providing leadership in the provision and maintenance of funds and facilities. Marshalling personnel and material for school operation. Sources of school support. Estimation, interpretation and management of expenditures. Planning, constructing and financing a school building. Utilization, operation and management of the school plant. Records, accounts, reports, and audits.

565. EDUCATIONAL SUPERVISION

Fall term. Credit three hours. W F 11-12:15. Warren 37. Professor Wardeberg.

A basic course in the nature and scope of supervision; fundamental principles and various procedures are considered. Open to those already in supervisory positions, either in school work or elsewhere, and experienced persons aspiring to becoming supervisors.

569. PERSONNEL ADMINISTRATION IN EDUCATIONAL INSTITUTIONS.

Fall term. Credit three hours. T Th 2-3:15 and one hour to be arranged. Warren 37. Assistant Professor Egner.

Designed to provide an introduction to modern psychological and sociological perspectives of personnel administration. Three purposes are para-

mount: (1) to acquaint the student with a variety of ways of conceiving the problems of personnel administration, (2) to acquaint the student with relevant research, and, (3) to develop some facility in the analysis of conceptual schemes and research projects.

668. SEMINAR IN EDUCATIONAL ADMINISTRATION

Spring term. Credit three hours. Prerequisites, Course 569 or 561, or consent of instructor. Time to be arranged. Warren 31. Professor McCarty and staff.

Planned for advanced students in administration. Major emphasis to be placed on the analysis of administrative theory and research from business, public, hospital, and industrial, as well as educational administration.

Agricultural Education

331. INTRODUCTION TO TEACHING AGRICULTURE

Spring term. Credit one hour. Required of juniors and others entering the directed teaching program in the senior or following year. M 2-4:30. Warren 31. Associate Professor Drake.

An introduction to the origin, development, objectives, course of study, individual farming programs, and method of teaching vocational agriculture in secondary schools.

332. METHODS, MATERIALS, AND DIRECTED PRACTICE IN TEACHING AGRICULTURE IN THE SECONDARY SCHOOL

Fall term. Credit nine hours. Staff in agricultural education.

Directed participation in off-campus centers in the specific and related problems of teaching agriculture on the junior and senior high school levels, to include adjustment in the school and community; evaluation of area resources, materials of instruction, and school facilities; organization and development of local courses of study; launching and directing supervised farming programs; planning for and teaching all-day classes; advising Future Farmer chapters; and other problems relating to development of a balanced program for vocational education in agriculture in a local area.

433. SPECIAL PROBLEMS IN AGRICULTURAL EDUCATION

Graduate and undergraduate. Fall or spring term. Credit one or two hours. W 12. Warren 31. Associate Professor Bail and staff.

The purpose is to provide students an opportunity to study individually, or as a group, selected problems in agricultural education to meet the particular needs of the students.

434. ORGANIZATION AND DIRECTION OF YOUNG FARMER PROGRAMS

Fall term. Credit three hours. F 3:45-5:45. Warren 37. Professor Cushman.

Emphasis will be placed on solving the problems encountered by teachers of agriculture in such phases of the young farmer program as making arrangements to have a program, determining instructional needs and planning programs of instruction, teaching young farmers in groups, giving individual on-farm instruction, organizing and advising the local young farmer association, and evaluating the young farmer program.

[531. SUPERVISION IN AGRICULTURAL EDUCATION

Fall term. Credit two hours. Offered in alternate years. Open to students with experience in teaching agriculture, or by permission. Associate Professor Bail.] Not given in 1966-1967.

The function of supervision, program planning, and supervisory techniques as applied to state programs in agricultural education.

532. ADVANCED METHODS AND MATERIALS OF TEACHING AGRICULTURE

Fall term. Credit two or three hours. M F 2-3:30. Warren 101. Associate Professor Tom.

Consideration is given to an analysis of selected teaching techniques and to the selection, preparation, and use of instructional materials in agriculture.

533. PLANNING COURSES OF STUDY AND AGRICULTURAL EXPERIENCE PROGRAMS IN AGRICULTURE

Spring term. Credit three hours. M F 2-3:30. Warren 232. Professor Hill.

Guiding principles, objectives, and sources of information will be developed for planning the courses of study and teaching calendar. Consideration will be given to principles, meaning, and function of agricultural experience programs, and how they are planned and used as a means of instruction.

534. EDUCATION FOR LEADERSHIP OF YOUTH AND ADULT GROUPS

Fall term. Credit two hours. Th 2-4. Warren 101. Professor Cushman.

Designed for leaders in the field of agricultural education who are responsible for organizing programs. A consideration of the principles involved in organizing and conducting out-of-school programs for young and adult farmers.

535. PLANNING AND CONDUCTING PROGRAMS OF TEACHER PREPARATION IN AGRICULTURE

Fall term. Credit two hours. Given in alternate years. M 3:45-5:45. Warren 232. Professor Hill.

Open to persons with teaching experience in agriculture who are preparing for or are engaged in the preparation of teachers, or in related educational service.

536. ORGANIZATION AND ADMINISTRATION OF AGRICULTURAL EDUCATION

Spring term. Credit two hours. Given in alternate years. W 2-4. Warren 31. Professor Cushman.

Designed for teachers, high school principals, teacher trainers, supervisors, and others who are responsible for the administration of agricultural programs or who wish to qualify for this responsibility. Emphasis will be placed on interpreting the vocational acts and on problems of administration at the local and state level.

538. TEACHING GENERAL AGRICULTURE IN THE SECONDARY SCHOOL

Spring term. Credit two hours. F 4:15-6. Warren 31. Associate Professor Tom.

The organization, purpose, and content of courses in agriculture in junior and senior high schools to serve those who elect to study agriculture for its general educational values in preparation for rural living.

[539. EVALUATING PROGRAMS OF AGRICULTURAL EDUCATION

Spring term. Credit two hours. Given in alternate years. Open to students with experience in teaching agriculture, or by permission. Associate Professor Drake.] Not given in 1966-1967.

Students will study objectives and evaluative criteria, and will develop criteria and procedures for evaluation of programs of agricultural education in the secondary schools.

630. SEMINAR IN AGRICULTURAL EDUCATION

Spring term. Credit one hour. W 4:15-6. Warren 31. Associate Professor Tom.

Recommended for Master's degree candidates who have had teaching ex-

perience and doctoral candidates with majors and minors in agricultural education. The seminar will be primarily centered around current problems and research in the field.

Curriculum and Instruction

444. SEMINAR IN THE TEACHING OF SECONDARY MATHEMATICS
Spring term. Credit three hours. T Th 4-5:15. Warren 232. Associate Professor Geiselmann.

Useful materials and practical methods for effective teaching of mathematics in the junior and senior high schools. Attention will be given to research in mathematics education, and to recent proposals for curriculum revision. Special interests of the students serve as a guide for the further selection of topics.

447. JUNIOR HIGH SCHOOL EDUCATION

Fall or spring term. Credit two or three hours. Limited to seniors and graduate students. Hours to be arranged. Associate Professor Vars.

Examines educational programs for young adolescents in the light of the history, status, and philosophy of the junior high school. Includes guidance, articulation, exploration, general education programs such as block-time and core, and such recent developments as programmed instruction and team teaching.

540. THE ART OF TEACHING

Fall or spring term. Credit and hours as arranged. Students may register only with the consent of appropriate supervisor. Professors Peard and Wardeberg, Associate Professors Geiselmann, Lowe, and Vars and Assistant Professor M. Bruce.

For students enrolled in fifth-year teacher education programs. Students will be assigned to elementary and secondary schools for directed field experience. Seminars will be scheduled concurrently.

541. INTERNSHIP IN JUNIOR HIGH SCHOOL TEACHING

Fall or spring term. Credit six hours. Designed especially for interns in the Junior High School Project. Course 543 must be taken concurrently. Associate Professors Geiselmann, Lowe, and Vars and Assistant Professor M. Bruce.

Full-time directed teaching experience in a public school throughout the school's fall or spring semester.

542. SECONDARY EDUCATION IN THE UNITED STATES

Fall term. Credit three hours. Limited to graduate students. Prerequisites, courses in educational psychology and social foundations of education, or permission of instructor. Th 2-4 and one hour to be arranged. Plant Science 141. Professor M. Johnson.

Historical background and theoretical considerations relating to curriculum and instruction in American secondary schools.

543. SEMINAR IN JUNIOR HIGH SCHOOL TEACHING

Fall or spring term. Credit two hours. Limited to interns in Junior High School Project. Hours and place to be arranged. Professor M. Johnson, Associate Professors Geiselmann, Lowe, and Vars and Assistant Professor M. Bruce.

Discussion of problems arising in the course of intern teaching.

545. THE CURRICULUM OF AMERICAN SCHOOLS

Fall term. Credit three hours. Enrollment limited to graduate students, teachers, or other school specialists. M 4-6 and one hour to be arranged. Warren 31. Associate Professor Lowe.

An examination of curriculum content, principles, and processes viewed in the setting of educational history and the current educational scene. Students will be expected to relate curriculum theory and trends to their specific problems and needs. A research paper or applied project will be required.

546. TEACHING READING AND THE LANGUAGE SKILLS

Fall term. Credit three hours. M Th 2-3:15. East Roberts 223. Professor Wardeberg.

Materials and techniques in teaching the language arts in the elementary school; special emphasis on the teaching of reading.

547. SEMINAR IN ELEMENTARY EDUCATION

Fall and spring terms. Credit and hours as arranged. Professor Wardeberg.

A problems seminar. For students enrolled in Course 540.

645. SEMINAR IN CURRICULUM THEORY AND RESEARCH

Credit three hours. Registration by permission of instructor. T 2-4. Professor M. Johnson.

Educational Psychology and Measurement

110. GENERAL PSYCHOLOGY

Fall or spring term. Credit three hours. May not be taken for credit by students who have had Psychology 101 or equivalent. Two lectures plus one discussion section each week. Lectures, M W 10. Plant Science 233. Discussion sections, Th 9, 10, 11, or 12, or F 9, 10, 11, or 12. Assistant Professor McConkie.

A general survey of the field. Time is devoted to each of the major areas of psychology: physiological bases of behavior, sensation and perception, learning and remembering, language, thinking, individual differences and psychological testing, motivation, emotion, and abnormal psychology.

411. EDUCATIONAL PSYCHOLOGY

Fall or spring term. Credit three hours. Prerequisite, an introductory course in psychology. Fall term limited to students in teaching programs or, in exceptional cases, by special permission of the instructor. Spring term limited to students enrolled in the special block-time teacher-preparation program. Special permission of the instructor is required for students not in this program. Fall term, lectures, M W F 9. Comstock 245. Spring, blocked time, M W F 9-11. Plant Science 141. Professor Glock.

Consideration of the outstanding facts and principles of psychology bearing upon classroom problems.

417. PSYCHOLOGY OF ADOLESCENCE

Spring term. Credit two hours. Freshmen and sophomores not admitted. Prerequisite, a course in general psychology. T 2-4. Warren 245. Assistant Professor McConkie.

A survey of the nature of adolescent growth and development, with emphasis on some of the causal factors pertaining to adolescent behavior.

451. EDUCATIONAL MEASUREMENT

Spring term. Credit three hours. Not offered every year. Permission of the instructor required. Hours to be arranged. Associate Professor Millman.

A study of the construction of achievement tests and the use of aptitude tests, achievement tests, and other measuring instruments in the classification and guidance of pupils and improvement of instruction.

453. INTRODUCTION TO EDUCATIONAL STATISTICS

Fall and/or spring term. Credit three hours. T Th 8-10. Warren 245. Permission of instructor required. Associate Professor Millman.

A study of common statistical procedures encountered in educational literature and research. Includes the computation and interpretation of descriptive measures and tests of significance.

454. STATISTICAL INSTRUMENTS IN EDUCATION

Spring term. Credit three hours. Not offered every year. Prerequisite, Course 453 or permission of the instructor. T Th 8-10. Warren 145. Associate Professor Millman.

A study of the multiple regression, factor analysis, analysis of variance and covariance, and other statistical procedures useful in educational research.

511. EDUCATIONAL PSYCHOLOGY

Fall term. Credit three hours. Permission of instructor required. M W F 11. Warren 232. Professor Glock.

A basic course in educational psychology for graduate students.

Extension, Adult, and Higher Education

Other divisions and departments that offer additional courses helpful in the field of extension education are:

- Home Economics
- Rural Sociology
- Sociology
- Agricultural Economics
- Anthropology

Extensive flexibility is permitted each student in the selection of a course program to meet his special interests and professional needs.

512. THE COOPERATIVE EXTENSION SERVICE

Spring term. Credit three hours. Open to juniors and seniors by consent. M W F 11. Warren 232. Associate Professor Bruce.

An examination of the role and function of cooperative extension as an educational institution.

523. ADMINISTRATION AND SUPERVISION OF COOPERATIVE EXTENSION PROGRAMS

Fall term. Credit three hours. W 2-4 and one hour to be arranged. Warren 232. Associate Professor Bruce.

An application of principles of administration and supervision to the problems of organizing and operating the Cooperative Extension Service.

524. PRINCIPLES OF EXTENSION EDUCATION PROGRAMING AND TEACHING

Fall term. Credit three hours. For graduate students interested in the principles and procedures basic to the development and execution of extension, adult, and community development programs. Lecture, M 10. Lecture-discussion, T 2-3:30. Warren 232. Professor Leagans.

A study of the problems, principles, and general procedures commonly

involved in developing and carrying out successful educational programs to promote economic and social change.

525. COMMUNICATION IN EXTENSION AND COMMUNITY DEVELOPMENT PROGRAMS

Spring term. Credit three hours. For graduate students interested in a comprehensive understanding of theory, principles, procedures and techniques of communication as applied in Extension Education-Community Development programs. Lecture, M 10. Lecture-discussion, T 2-3:30. Warren 131. Professor Leagans.

Analysis of basic elements in the communications process with emphasis on the nature and role of the communicator, audience, message, channels, message treatment and audience response.

[621. SPECIAL STUDIES IN EXTENSION EDUCATION

Fall term. Credit two hours. Lectures, individual time to be arranged. Professor Leagans and Associate Professor Bruce.] Not given in 1966-1967.

The objective is to provide assistance in thesis preparation to graduate students in extension education. The course consists of three parts: (1) exploration of potential fields and specific delineation of thesis areas; (2) setting up a plan of thesis organization including establishment of objectives or hypotheses, preparation of questionnaires, or other research instruments, collection, analysis, and interpretation of data in line with objectives; and (3) preparation of the thesis, its writing, editing, revising, and styling.

626. SEMINAR: COMPARATIVE EXTENSION EDUCATION SYSTEMS

Fall term. Credit two hours. Open to graduate students and advanced undergraduates. Th 2-4. Warren 160. Professor Leagans.

A comparative analysis of the objectives, organization, procedures, achievements and problems of selected extension education and community development agencies and programs in different circumstances of economic, social, and political development and in different agricultural resource environments. Country programs for major consideration are selected in line with the interests of seminar members.

627. SEMINAR: IMPLEMENTING EXTENSION AND COMMUNITY DEVELOPMENT PROGRAMS IN DEVELOPING COUNTRIES

Spring term. Credit two hours. Open to advanced students with experience in rural development programs by permission of the instructor. Th 2-4. Warren 260. Professor Leagans.

Analysis of major problems of implementing programs for economic and social change in non-western cultures. Key problems including administrative organization and policy, selection and training of personnel, setting objectives and goals, financing programs, communication and evaluation will be considered along with others suggested by seminar members.

628. SEMINAR: CURRENT PROBLEMS AND ISSUES IN EXTENSION EDUCATION

Spring term. Credit two hours. Open by permission of instructor to graduate students in extension education or other fields with special relevance to the seminar topic. W 2-4. Plant Science 141. Associate Professor Bruce.

A major area of concern to extension education will be selected for intensive study by participating students and faculty.

SEMINAR: INTERNATIONAL AGRICULTURAL DEVELOPMENT (International Agriculture 600.)

Guidance and Personnel Administration

582. EDUCATIONAL AND VOCATIONAL GUIDANCE

Fall term. Credit two hours. For graduate students only. T 4-6. Warren 201. Professor A. G. Nelson.

Principles and practices of educational and vocational guidance. Historical and theoretical background of the guidance movement; educational, vocational, and community information needed; the study of the individual; group methods; counseling; placement and follow-up; the organization, administration, and appraisal of guidance programs.

583. COUNSELING

Spring term. Credit two hours. For graduate students only. Prerequisites, Courses 555 and 582 or their equivalents. M 4:15-6. Warren 201. Professor A. G. Nelson.

Principles and techniques of counseling with individuals concerning various types of educational, social, and vocational and social adjustment problems. Case studies.

584. GROUP TECHNIQUES IN GUIDANCE

Spring term. Credit two hours. Prerequisite, permission of the instructor. T 4:15. Warren 201. Professor A. G. Nelson.

Methods and materials for presenting educational and orientation information to students. Theory and practice of group guidance and counseling in a group setting.

585. OCCUPATIONAL AND EDUCATIONAL INFORMATION

Fall term. Credit four hours. Permission of the instructor required. T Th 1. Field trips and laboratory, M afternoon. Warren 160. Professor A. G. Nelson.

Survey and appraisal of occupations and training opportunities; study of sources of educational and vocational information; job analysis; vocational trends. Field trips to places of employment.

History, Philosophy, and Sociology of Education

470. SOCIAL AND PHILOSOPHICAL FOUNDATIONS OF EDUCATION

Either term. Credit three hours. Registration in morning sections limited to 50 students; afternoon sections, 25 students. Associate Professor Ennis, Chairman. Fall term: M W F 10, Comstock 245, Associate Professor Gowin; T Th 2-3:30, Plant Science 37, Professor to be appointed. Spring term: T Th 2-3:30, Associate Professor Ennis; M W F 10, Professor Peard. Comstock 245.

A study of the persistent problems of education in a democracy. For most teacher certification programs, this course meets the minimum requirement in New York State for social and philosophical foundations of education. In addition, a course in history, philosophy, or sociology of education is recommended.

471. LOGIC IN TEACHING

Fall term. Credit three hours. Consent of instructor required. T Th 4:15-5:45. Warren 37. Associate Professor Ennis.

A consideration of definitions, explanation and proof, as they bear upon the work of the classroom teacher.

574. HISTORY OF EDUCATION IN THE MODERN PERIOD

Spring term. Credit three hours. For graduate students. Seniors admitted

with permission of the instructor. M 4-6 and one hour to be arranged. Warren 160. Professor to be appointed.

An examination of educational thought and practice from the seventeenth century to the present in the setting of the general developments in Western Europe and the United States. Principal attention will be given to the educational purposes and systems of France, Germany, the United Kingdom, the USSR, and the United States. A special paper will be required.

578. COMPARATIVE EDUCATION

Spring term. Credit three hours. T Th 2-3:30. Plant Science 37. Professor to be appointed.

A comparative treatment of several national systems of education from a historical perspective.

671. SEMINAR: ANALYSIS OF EDUCATIONAL CONCEPTS

Spring term. Credit three hours. Admission by consent. M 2-4. Warren 260. Associate Professor Ennis.

Topic for 1966-1967: To be announced.

Nature Study, Science and Conservation Education

[402. NATURAL HISTORY LITERATURE

Fall term. Credit two hours. Associate Professor Fischer.] Not given in 1966-1967.

A survey of writings in the nature, science, and conservation education fields, with special attention to outstanding writers and their works, designed for teaching and for leisure-time reading.

403. NATURAL HISTORY WRITING

Spring term. Credit two hours. T Th 11. Stone 7. Associate Professor Fischer.

Designed to improve natural history, science, and conservation writings. Subject matter, sources of information, types of articles, use of illustrations, and outlets for students' articles are covered.

407. TEACHING OF ELEMENTARY SCHOOL SCIENCE

Fall term. Credit three hours. Registration by permission. Lecture, W 1:40; practical exercises, W 3-4:30 and one other period to be arranged. Stone 7. Professor Rockcastle.

The content and methods of elementary-school science and nature study, with field work and laboratory experience useful in classroom and camp. Designed particularly for those who are preparing to teach or supervise elementary science or nature study.

409. OUR PHYSICAL ENVIRONMENT

Spring term. Credit three hours. Open to juniors, seniors, and graduate students primarily interested in public school teaching. Lecture, W 1:40. Practical exercises, W 3-4:30 and one other period to be arranged. Stone 7. Professor Rockcastle.

A study of the commonplace phenomena and substances in our physical environment, and their use in demonstrating basic scientific principles. Frequent field trips and first-hand examination will be used in studying air, water, soil, light and sound, as well as some elementary mechanical and electrical devices. Emphasis will be placed on the physical environment as an aid to teaching the physical sciences in the public secondary schools.

424-5. FIELD NATURAL HISTORY

Fall or spring term. A full-year course; may be taken either term or both terms. Credit three hours. Open to juniors and sophomores with instructor's permission. Limited to twenty students per section. Lecture: Fall term, Th 10; spring term, T 10. Stone 7. Weekly field trips and lecture, T or F 1:40-4:30, begin with the first meeting. Friday section primarily for those experienced in field biology. Associate Professor Fischer.

Devoted to studies of local plants and animals, their ecology and their relations to humans. Applications to teaching science and conservation are emphasized.

428. METHODS OF TEACHING SCIENCE IN SECONDARY SCHOOLS

Fall or spring term. Credit three hours. For juniors, seniors, and graduate students without teaching experience. Prerequisite, Educational Psychology 411 or the equivalent or concurrent registration. Fall term, Th 1:40-4:30, and hours for observation to be arranged; spring term, M or Th, 1:40-4:30. Stone 7. Assistant Professor M. Bruce, and assistants.

A consideration of methods and materials useful in teaching science in secondary schools. Observation of the work of experienced teachers constitutes an important part of the course.

429. PRACTICE IN TEACHING SCIENCE IN SECONDARY SCHOOLS

Fall or spring term. Credit six or twelve hours. Prerequisites, Course 428 or 507 and permission of the instructor. Hours to be arranged. Assistant Professor M. Bruce and assistants.

Supervised practice in teaching science in secondary schools, with frequent conferences on teaching plans and problems.

505. TEACHING OF CONSERVATION

Fall term. Credit two hours. T Th 11. Stone 7. Associate Professor Fischer.

Consideration of the principles, materials, and methods of conservation education useful to teachers and others engaged in teaching the wise use of the resources of the nation.

[507. TEACHING OF SCIENCE IN SECONDARY SCHOOLS

Fall term. Credit three hours. For graduate students with teaching experience, and others by permission only. Professor P. G. Johnson and assistant.] Not given in 1966-1967.

A consideration of problems of selection and organization of subject matter, of choice and use of materials, and of methods of teaching science at the secondary-school level.

[509. DEVELOPMENT OF NATURE AND SCIENCE EDUCATION IN THE UNITED STATES

Fall term. Credit two hours. M 1:40-4:30. Stone 7. Professor Rockcastle, Associate Professor Fischer, and Assistant Professor Bruce.] Not given in 1966-1967.

Studies of the historical development of science teaching, the major personalities and their ideas, and current influences on science course content and methods of teaching.

606. RESEARCH IN NATURE STUDY, SCIENCE, AND CONSERVATION EDUCATION

Fall or spring term. Credit one hour. Required of graduate students who major or minor in science education. M 4:30-6. Stone 7. Professor Rockcastle, Associate Professor Fischer, and Assistant Professor M. Bruce.

A seminar dealing with special problems.

General Education

499. INFORMAL STUDY IN EDUCATION

Maximum credit three hours each term. Members of the staff.

This privilege is granted to a qualified junior, senior, or graduate student, when approved by an adviser from the education staff who is personally responsible for the study. Two purposes are sanctioned: 1) to engage in a study of a problem or topic not covered in a regular course, or 2) to undertake tutorial or honors study of an independent nature in the area of the student's research interests. The privilege is not designed to engage in a study supplementary to a regular course for the purpose of increasing the content and credit allocation of the course.

500. SPECIAL STUDIES

Credit as arranged. Members of the staff. Limited to graduate students working on theses or other research projects. Each registration must be approved by a staff member who will assume responsibility for the work.

599. INTRODUCTION TO EDUCATIONAL INQUIRY

Fall term. Credit four hours. T Th 11-1. Warren 145. Associate Professor Millman and staff.

An introduction to the processes that underlie the conduct of significant research in education. The central objective of the course is to prepare the student to produce better educational research and to be a more intelligent consumer of research already reported. The course is designed for the graduate student beginning work on a general degree or on the Ed.D. It is not intended for professional Master's degree candidates.

600. INTERNSHIP IN EDUCATION

Fall and spring terms. Credit two to six hours, as arranged. Members of the faculty.

Opportunity for apprentice or similar practical experience on the graduate level in administration, agricultural education, guidance, personnel administration, supervision, and other types of professional service in education.

RURAL SOCIOLOGY

Students who specialize in rural sociology may choose a sequence of courses designed (1) to provide a broad general training for work with farm and community organizations, in rural development, and in the social services, (2) to provide the foundation for later professional training in the field of social service, or (3) to prepare for a career in research, teaching, and extension in rural sociology. In general, graduate study is required for those wishing to become professional sociologists.

100. GENERAL SOCIOLOGY

Fall or spring term. Credit three hours. May not be taken by those who have credit for Sociology 101. Lectures, T Th 10. Warren 45. Discussion sections, M 8, 9, 10, 11, or 2 and F 8, 9, 10, 11, or 2. Fall term, Assistant Professor Carroll; spring term, Assistant Professor Eberts.

A general introduction to the theory and methods of sociology. Major topics selected for discussion include culture, socialization, deviancy and social control, stratification, ideologies, and social change. Supplementary reading including recent research will be assigned for illustrative purposes and to assist students in analyzing topical areas as term projects.

200. SOCIETAL SYSTEM STRESSES

Fall term. Credit three hours. Prerequisite, Course 100 or equivalent. M W F 10. Warren 31. Assistant Professor Eberts.

Analysis of selected "social problems" and "deviant behavior" as symptoms of stress in a society's development process. Included are problems of the economy such as unemployment and automation, of population growth such as allocation of food "surpluses" and birth control, of sub-cultural processes such as segregation and juvenile delinquency, and of imposition from "external" forces such as natural disasters and foreign intervention. Brief examination of various modes of system response to stresses.

210. FOUNDATIONS FOR SOCIAL ACTION.

Spring term. Credit three hours. Not open to freshmen. M W F 10. Warren 145. Professor Reeder.

The purpose is to provide the basic information essential to an understanding of social action and planned change. The course is designed for two categories of students: (1) students of various fields who wish to take one or two courses in sociology and who want to gain the kind of knowledge which relates directly to human relationships in their occupation and in their activities as organization members and citizens; (2) persons whose work or interests are likely to involve them in some phase of planned change—either as administrators, organization leaders, extension agents, teachers, or community development workers—and others for whom the role of change agent is an essential part of their job.

300. RURAL SOCIOLOGY

Fall term. Credit three hours. Not open to freshmen or sophomores. M W F 11. Warren 145. Professor Capener.

The aim of this course is to provide students, particularly those specializing in other fields, with an introduction to principles and concepts of the field of rural sociology. It is designed to increase students' ability to utilize and apply concepts and theoretical frameworks from rural sociology.

Major areas will be the applied considerations of the institutional structure of American society, the patterning of roles and functions within these and lesser social systems, the social change process, the diffusion of new ideas, the principles of leadership, and considerations of functional roles in public action programs.

324. THE SOCIOLOGY OF WORK

Fall term. Credit three hours. Not open to freshmen or sophomores. Prerequisite, Course 100 or equivalent. Lectures and discussions, M W F 9, Warren 232. Professor Taieztz.

The following topics are covered: (1) the function of work for society and the individual, (2) bureaucratic structure and specialization, (3) the development of occupational norms and identification, (4) occupational status, (5) the process of occupational selection, (6) dynamics of occupational change—horizontal and vertical mobility, (7) a case study of an occupation: trends in the professionalization of social work.

[334. RURAL SOCIAL PROBLEMS AND PUBLIC POLICY

Spring term. Credit three hours. Given in alternate years. Not open to freshmen or sophomores. M W F 9. Warren 31. Professor Larson.] Not given in 1966-1967.

Relates the problem concept to a theoretical frame of reference, traces the development of social problems in American rural life, analyzes the policy-making process, and treats the sociological aspects of such current public problems in the United States as low-income and underemployed farmers,

migratory agricultural labor, and institutionalized social services. Each problem selected is analyzed in terms of historical background, public policy, national programs, and the consequences of the policy and program. Comparisons are made with other countries.

335. AGRARIAN SOCIAL MOVEMENTS

Spring term. Credit three hours. T Th 9-10:30. Warren 31. Associate Professor Harp.

A sociological analysis of the major agrarian social movements in the United States and Canada. An interpretation of relevant research findings in terms of current theories of collective behavior. The organizational structure and function of major farmer organizations are examined in a context of interconnections and interdependencies among social structures.

405. ORGANIZATION METHODS

Spring term. Credit three hours. Prerequisite, Course 100 or 210 or permission of the instructor. Not open to freshmen or sophomores. T Th 11-12:50. Warren 31. Professor Reeder.

A study of the methods and techniques by which officers, group members, and administrators may increase the effectiveness of organizations. Five categories of organization problems are considered: (1) program problems, (2) leadership problems, (3) membership problems, (4) problems related to meetings, and (5) organizational and public relations problems. Primary emphasis is given to organizations and service agencies which are found in rural society, such as farm bureau, home bureau, Grange, 4-H, churches, schools, fraternal organizations, and civic clubs. Designed to give students experience in using some of the basic organization methods.

411. COMMUNITY DEVELOPMENT AND PLANNED CHANGE

Fall term. Credit three hours. Prerequisite, Course 100 or 210 or permission of the instructor. T Th 11-12:30. Warren 31. Professor Reeder.

A consideration of the problems involved in helping people and organizations in a community work together to meet their common needs.

There are two major emphases: (1) analysis of communities from the perspective of the community development worker as a change agent, (2) consideration of the problems which confront community development workers and the processes and methods by which they carry out their various community development tasks. Projects in nearby communities provide field laboratory experiences.

412. RURAL SOCIAL SYSTEMS

Fall term. Credit three hours. Prerequisite, Course 100 or equivalent. Not open to freshmen or sophomores. M W F 9. Warren 31. Professor Larson.

Intended as a basic course in the sociology of rural life, using the social system concept as a theoretical framework. Rural society in the United States is used as a case to illustrate the structure and function of major rural social systems in modernized societies. Comparisons are made with western European countries. The changing relationship with urban and societal systems is discussed. Some consideration is given to the implications of social structure and function for action programs serving rural people. Field trips to rural areas arranged.

414. LATIN AMERICAN SOCIETIES IN TRANSITION

Spring term. Credit three hours. Prerequisite, introductory course in sociology. Lectures, M W 2. Warren 131. Discussion, F 2. Warren 31. Associate Professor Ellenbogen.

The unit of analysis is the community. Emphasis is given to identifying a

variety of "types" of rural communities in Latin America. Focus is on the changes occurring in population, technology, and organizational structure. Activities such as production-consumption, social control, socialization, etc., are analyzed. Consideration is also given to the linkages between "types" of rural communities and national and international associations. Other precipitants of social change, both "external" and "internal" to the rural community, are taken into account.

420. COMPARATIVE RURAL SOCIETIES

Fall term. Credit three hours. Prerequisite, a course in general sociology or anthropology. M W F 11. Warren 231. Associate Professor F. W. Young.

A comparison of the social organization of rural life in selected countries. The emphasis is on the social structure and the value systems of societies undergoing rapid change.

421. COMMUNITY STRUCTURE AND CHANGE

Fall term. Credit three hours. Open to seniors and graduate students; others by permission. T Th 3-4:30. Warren 260. Assistant Professor Carroll.

Focus is on the development of a systematic conceptualization of the community. The theory of human ecology is examined. The course analyzes varieties of communities, community change and development, community structure, and systems of communities. Students will review recent and pertinent research on the community.

432. COMMUNITY LEADERSHIP

Spring term. Credit three hours. Prerequisite, an introductory behavioral science course, or permission of the instructor. Lecture, T 9. Discussion, W 2-4. Warren 232. Associate Professor Cummings.

A study of leadership theories and strategies as applied to community development. The nature of leadership requirements in a political democracy are examined along with implications for leader education in public affairs.

437. THE SOCIOLOGY OF AGING

Spring term. Credit three hours. Prerequisite, Course 100 or equivalent. T Th 2-3:30. Warren 232. Professor Taietz.

The theory and research in this growing field will be examined. Programs for the aged in the United States and Western Europe will be evaluated, and the assumptions underlying these programs will be analyzed.

441. POLITICS, SOCIAL CONTROL AND PLURALISM

Fall term. Credit three hours. Open to seniors and graduate students, others by permission. Prerequisite, Course 100 or equivalent. T Th 11-12:30. Warren 232. Assistant Professor Eberts.

Substantive and methodological analysis of issues related to problems in social control and pluralism. Pluralism and control will be viewed in relation to productive, allocative, and staffing processes of society, as they affect various occupational categories, different size communities, and institutions primarily responsible for maintaining social order.

500. EVALUATION RESEARCH

Fall term. Credit two hours. Registration by permission only. F 3-5. Warren 31. Professor Alexander and Associate Professor Longest.

Evaluation as measurement of induced change resulting from action programs and extension education. Public concern with evaluation. Organizing for evaluation. Kinds and levels of evaluation. Utilizing the findings of evaluation studies and research. The by-products of evaluation. Principal emphasis on methodology and techniques, including review of significant evaluation studies and research. Course includes laboratory and field work.

515. RESEARCH DESIGN

Fall term. Credit three hours. Open to graduate students only. T Th 1:40-3. Warren 232. Associate Professor Harp.

An introduction to the methods of social research. Course topics follow the major steps in the design and execution of sociological research from the definition of the problem and formulation of hypotheses to the interpretation of results and preparation of a final report. Practice exercises are assigned each week utilizing data from departmental projects.

516. CROSS-CULTURAL RESEARCH METHODS

Spring term. Credit three hours. Prerequisite, Course 515 or permission of the instructor. W F 1:40-3. Warren 201. Associate Professor F. W. Young.

Problems of adaptive methods to other cultural settings as well as the use of specifically cross-cultural procedures. Discussion of modifications of surveys, key informant interviews, observation techniques, photography, case studies, and the exploitation of census and other available data. Special attention to comparisons based on the data of the Human Relations Area files. Consideration of designs, units of analysis, variables, and hypotheses relevant to problems of less developed countries.

[525. THE SURVEY METHOD IN SOCIAL ACTION RESEARCH

Spring term. Credit two hours.] Not given in 1966-1967.

A number of the more important theories of social action are examined. Action research designs are developed by the class, utilizing some of the theories reviewed. Consideration is given to the researcher-sponsor relationships in defining the research problem and planning the survey or self-survey, alternative methods of data collection, and interviewing techniques and report writing. Approaches to the feedback of survey findings to the consumer are also explored.

528. APPLICATIONS OF SOCIOLOGY TO DEVELOPMENT PROGRAMS

Spring term. Credit three hours. Open to graduate students only. M F 11-12:30. Warren 31. Professor Polson.

Application of sociological theory and methods to the problems of institutions and agencies concerned with rural development. Special emphasis is placed on programs for agricultural extension education and community development in low-income countries.

530. CONTEMPORARY THEORIES OF SOCIAL CHANGE

Fall term. Credit three hours. Open to graduate students and to seniors with consent of the instructor. W F 3-4:30. Warren 260. Associate Professor Ellenbogen.

Selected conceptual approaches of social evolution, revolution and "modernization" are examined. Consideration is given to diffusion, innovation and "social stress" as precipitants of change. Attention is given to designing "partial theories" related to changes of a small-scale magnitude.

[605. SEMINAR IN POPULATION THEORY

Fall term. Credit three hours. Graduate students or permission of the instructor.] Not given in 1966-1967.

A critical review of population theory. Theoretical assumptions underlying population policies. Introduction to research methods used in population analysis.

[613. SEMINAR: RURAL SOCIOLOGY

Spring term in alternate years. Credit three hours. Prerequisite, Course 412. Hours to be arranged. Professor Larson.] Not given in 1966-1967.

A review of the development of rural sociology and of the theoretical points of view represented in systematic works. A review of research literature in selected major subfields of rural sociology. Emphasis is on sociological generalizations and on the integration of theory and research.

638. METHODOLOGICAL APPROACHES TO THEORY CONSTRUCTION

Spring term. Credit three hours. Open to graduate students only. T Th 2-3:30. Warren 201. Associate Professor Harp.

A seminar designed to present and discuss the major problems of theory construction and testing within sociology. Topics include the nature of scientific theory, presentation of frames of reference and theoretical arguments, formalization of theoretical systems and types of formal systems, models and axiomatization. Illustrations will be drawn from various substantive fields within the discipline.

Departmental Seminar, Research and Special Study

350. UNDERGRADUATE RESEARCH

Fall and spring terms. Credit one to three hours, by arrangement, depending upon the problem undertaken. A student desiring to register must obtain the permission of the professor who will supervise the work.

550. INFORMAL STUDY IN RURAL SOCIOLOGY

Throughout the year. Credit to be arranged. Prerequisites, graduate standing and permission of the department staff member concerned. Members of the staff.

551. RESEARCH IN RURAL SOCIOLOGY

Throughout the year. Credit to be arranged. Prerequisites, graduate standing and permission of the staff member concerned. Members of the staff.

699. SEMINAR

Fall and spring term. No credit. For graduate students majoring in rural sociology. Second and fourth Monday of each month, 3:30-5. Warren 32. Departmental staff.

STATISTICS AND BIOMETRY

Four-year students interested in specializing in statistics may obtain suggested sequences of courses by consulting members of the Biometrics Unit, Department of Plant Breeding. Although positions are available in this field for graduates with the Bachelor's degree, many students will be preparing for graduate study. It is recommended that the student be competent in mathematics and at least one other area of specialization in the College. For courses in statistical genetics and special topics see courses listed under Plant Breeding.

200. DATA COLLECTION AND INTERPRETATION

Spring term. Credit three hours. M W F 8. Warren 160.

An introduction to the basic concepts and definitions in measurement, the principles of scientific experimentation, and graphical presentations. A historical résumé of experimentation will be presented, together with

methods for obtaining data related to a phenomenon of interest. Elementary definitions and concepts of sample survey and experimental designs will be presented, considerable emphasis will be placed on obtaining meaningful data and upon designing information into data. Elementary methods of summarizing meaningful facts from the data will involve the arithmetic mean, median, mode, variance, range, ranks, and measures of association. In this connection considerable use will be made of the material in D. Huff's book, *How to Lie with Statistics*, Holman's book, *Simplified Statistics*, I. D. Bross' book entitled *Design for Decision*, M. J. Monroney's book *Facts from Figures*, and C. C. Li's book, *Numbers from Experiments*. Material on U.S. Government statistics relative to types and methods of procuring data will be included as time permits. Elementary concepts of populations, sampling from populations, model building, probability, frequency distributions, estimation of population parameters, and perhaps hypothesis testing through use of rank sum and rank order statistics will be presented. Emphasis will be on ideas, concepts, and understanding rather than on methods. The material in this course is complementary to the material presented in Industrial and Labor Relations 210, and non-repetitive.

407. COMPUTER TECHNIQUES FOR STATISTICS

Fall term. Credit two hours. Prerequisite, an introductory course in statistics. May be taken concurrently. Lecture, M 11. Warren 245. Associate Professor Searle.

Introduction to uses of computers in statistics: calculation of elementary statistical analyses, techniques of sampling and simulation, and availability of library programs. CORC, the Cornell Computing language, will be taught and used for problem solving; use will also be made of some of the CUSTAT (Cornell University Statistics) library programs.

408. ALGEBRA FOR STATISTICS I

Fall term. Credit two hours. Prerequisite, a course in statistical methods. May be taken concurrently. Lecture, W F 11. Warren 245.

Algebra and associated topics related to the statistical procedures of Course 510 and other introductory statistics courses on campus such as Mathematics 370 and Course 410.

409. ALGEBRA FOR STATISTICS II

Spring term. Credit two hours. Prerequisite, Course 408. Lectures, W F 11. Warren 245.

Continuation of 408, at the level of Course 511.

410. MATHEMATICAL AND STATISTICAL MODELS IN BIOLOGY

Fall term. Credit three hours. Prerequisites, Mathematics 112 and Biological Sciences 281 or permission of the instructor. Lectures, M W F 10. Warren 315. Discussion period to be arranged. Professor to be appointed.

An introduction to the use of mathematical and statistical models in the study of biological phenomena. Elementary concepts of probability theory are introduced in developing models of Mendelian genetics and models of simple genetic experiments. Concepts and methods of statistical inferences, including point estimation, interval estimation, model testing and hypothesis testing, are presented in the context of drawing genetic inferences from experimental observations. The planning of genetic experiments is studied as a problem of achieving both statistical identifiability and statistical efficiency.

Other biological phenomena are examined which lead to discrete probability models of the Poisson, negative binomial and logarithmic distributions and compounds of these distributions. Continuous models are derived

as limiting forms of discrete models and as models representing quantal response. Methods of statistical inference are developed for each model considered, including exact, small sample procedures and approximate, large sample procedures. Standard statistical techniques covered in this course are maximum likelihood estimation, binomial and normal interval estimation, Students' *t*-test, the chi-square goodness-of-fit test, least squares regression, logit and probit analysis.

[411. STOCHASTIC MODELS IN BIOLOGY

Spring term. Credit three hours. Given in alternate years. Prerequisite, Course 410. Lectures, M W F 10. Warren 345. Discussion period to be arranged. Professor to be appointed.] Not given in 1966-1967.

An introduction to stochastic processes in biology. The necessary mathematics and statistics will be introduced as needed. Recurrent events, random walk models, Markovian processes, birth-and-death processes, epidemic processes, competition and predation, diffusion processes, and other models currently used in biological theory will be discussed and applied. Special emphasis will be given the various processes applied to genetics.

412. DETERMINISTIC MODELS IN BIOLOGY

Spring term. Credit three hours. Given in alternate years. Prerequisite, Course 410. Lectures, M W F 10. Warren 345. Discussion period to be arranged. Professor to be appointed.

An introduction to deterministic mathematical models in biology. The application will be from the biological viewpoint. The necessary mathematics will be introduced as needed. Finite differences, differential equations, logistic, growth and decay, and other deterministic models corresponding to those introduced in 411 will be discussed.

417. MATRIX ALGEBRA IN BIOLOGY AND STATISTICS

Fall term. Credit three hours. Prerequisite, the equivalent of one year of college algebra. Lectures, M W F 9. Warren 160. Associate Professor Searle.

Elements of matrix algebra with applications in biology and statistics. Arithmetic procedures and other matrix operations; rank and linear independence, latent roots and vectors, solving linear equations, generalized inverses, direct sums and products. Use of matrices in regression analysis and linear statistical models.

510. STATISTICAL METHODS I

Fall term. Credit three hours. Prerequisite, graduate standing or permission of instructor. T Th S 10. Warren 345. Laboratory to be arranged. Assistant Professor Urquhart.

The distributions of statistics encountered in biological and other fields are considered from the point of view of elementary probability notions and by sampling from known populations. The results, with principles of experimentation, are applied to the conducting of experiments and interpretation of results. The nature and validity of experimental error are treated. Topics include point and interval estimation, tests of hypotheses, the simpler experimental designs and their analyses of variance, linear regression, correlation, and methods involving rank order and rank sum procedures.

511. STATISTICAL METHODS II

Spring term. Credit three hours. Prerequisite, Course 510 or the equivalent. T Th S 10. Warren 345. Laboratory to be arranged. Assistant Professor Urquhart.

The work of Course 510 is continued. Topics include factorial experiments, individual degrees of freedom, analysis of covariance, analysis of variance

of two-way classifications with disproportionate numbers, multiple and curvilinear regression, curve fitting, the treatment of discrete data, some recent developments in statistics.

513. DESIGN OF EXPERIMENTS I

Fall term. Credit one, three, or four hours. Prerequisites, Courses 409 and 511, or the equivalent. M W F 8. Plant Science 141. Discussion period to be arranged. Professor Federer.

Principles and techniques of experimentation, extensions and variations of the completely randomized, randomized complete block, and latin square designs, the factorial experiment and confounding, fractional replication including response surface designs, lattice designs, crossover designs, augmented and other designs, covariance analyses, error rates, tests for ranked means, sample size, variance component analyses, and unequal number analyses.

514. DESIGN OF EXPERIMENTS II

Spring term. Credit three hours. Prerequisite, Course 513. M W F 8. Warren 201. Discussion period to be arranged. Professor Federer.

A continuation of the work in Course 513. A discussion from selected topics on long-term experiments, combination of results from several experiments, sequential experimentation, variance component analyses, estimation procedures, linear hypotheses, heritability studies, multivariate analyses, unequal numbers analyses, and related topics.

[517. LINEAR ESTIMATION AND TESTS OF HYPOTHESES

Spring term. Credit three hours. Prerequisite, Courses 417 and 511. Time and place of lectures to be arranged. Professor Robson.] Not given in 1966-67.

The material of this course is essentially that given in F. Graybill's book, *An Introduction to Linear Statistical Models*.

[518. SPECIAL TOPICS IN SEQUENTIAL SAMPLING, BIOASSAY, NON-PARAMETRIC STATISTICS, ETC.

Spring term. Credit three hours. Prerequisite, Course 511 or the equivalent. Time and place of lectures to be arranged. Professor Robson.] Not given in 1966-1967.

Topics include the principles and methodology of bioassay, discriminant functions, sequential analysis, nonparametric methods, mark-recapture methods, and path analysis.

VEGETABLE CROPS

Students planning to specialize to a greater or less extent in vegetable crops should consult the department regarding choice and sequence of courses. An outline of suggestions is available.

103. GENERAL HORTICULTURE

Spring term. Credit four hours. Lectures M W F 8. East Roberts 222. Laboratory, M W or Th 2-4:30. East Roberts 301. Associate Professor Sheldrake.

An introductory course in general horticulture, including flower, fruit, and vegetable growing. Intended primarily for students who want a general knowledge and for those who wish to specialize in some field of horticulture but have limited background, either in practical experience or in training in botany and agronomy.

210. VEGETABLE JUDGING, GRADING, AND IDENTIFICATION

Fall term. Credit one hour. T 2-4:30. East Roberts 301. Assistant Professor Topoleski.

Intended to prepare students to become competent in teaching this material to pre-adult groups when they are serving as teachers, agents, or leaders in 4-H and vocational agriculture. Subjects included are weed identification, insect and disease identification, vegetable judging, vegetable kind and variety identification, seed identification, potato defects and grading, and seedling identification.

211. COMMERCIAL VEGETABLE CROPS

Spring term. Credit four hours. Should be preceded by elementary courses in agronomy, botany, and chemistry. Course 103 or its equivalent is also recommended unless the student has considerable vegetable crops experience. Lectures, M W F 11. East Roberts 222. Laboratory, W or F 2-4:30. Vegetable Crops Greenhouse. Professor Sweet.

Intended for those interested in the commercial vegetable industry from the viewpoint of either production, processing, marketing, or the related service industries. Topics included are techniques, problems and trends in the culture, harvesting, storage, and marketing of the major vegetable crops for both fresh market and processing. The competitive position of the various regions is analyzed. Several field trips are taken.

212. HANDLING AND MARKETING VEGETABLES

Fall term. Credit three hours. Lectures, T Th 11. East Roberts 222. Laboratory, T or W 2-4:30. East Roberts 223. Professor Hartman.

(Students registered for the Tuesday laboratory are scheduled to go on a field trip at 9:30 a.m., on Wednesday, the day on which classes officially begin at noon in the fall term.)

Principles and procedures involved in the distribution, processing, and quality maintenance of vegetables from harvest to the ultimate consumer. Development, validation, and use, present and prospective, of instrumental measurements of color, texture, and flavor in vegetables. Specifications, purposes, and utilization of quality standards by food and health-control governmental agencies, by food manufacturers, and by research organizations.

222. POTATO PRODUCTION AND PROCESSING

Spring term. Credit three hours. Lectures, T Th 10. East Roberts 222. Laboratory, T 2-4:30. East Roberts 223. Professor Ora Smith.

General principles and practical phases of potato production, storage, and processing are discussed. Growth processes and soil and environmental factors are emphasized as influencing production. Topics such as storage methods, grading, packaging, cooking quality, nutritive value, processing, and industrial uses of potatoes also are studied. Two field trips, one of which is all-day, are taken to potato farms and processing plants.

331. UNDERGRADUATE RESEARCH

Fall and spring terms. Credit one or more hours a term, by arrangement. Registration by written permission of the staff member who is to direct the research. Any member of the staff.

Special problems may be elected in any line of vegetable work.

401. VEGETABLE CROP PHYSIOLOGY

Fall term. Credit four hours. Prerequisites, Course 211 and Biological Sciences 240 or their equivalent. Lecture, M W F 11. East Roberts 222. Laboratory, M 2-4:30. Professor Kelly.

The physiological bases of cultural practice and the application of these principles to problems in vegetable production. Original literature is used to illustrate the principles involved. Experimental material is studied in the laboratory to amplify lecture topics. Subjects discussed include: mineral nutrition as influenced by fertilization programs and crop sequence; nutrient interactions and induced deficiencies; growth and development; flowering; fruit setting; growth correlation; senescence; sex expression; photoperiodism; vernalization; and environmental factors affecting growth.

412. HANDLING AND MARKETING VEGETABLES, ADVANCED COURSE
Fall term. Credit four hours. Lectures, T Th 11. East Roberts 222. Laboratory, T or W 2-4:30. East Roberts 223. One-hour conference to be arranged. Professor Hartman.

(Students registered for the Tuesday laboratory are scheduled to go on a field trip at 9:30 a.m., Wednesday, the day on which classes officially begin at noon in the fall term.)

This course has the same lecture, laboratories, and field trips as Course 212. Much more outside reading of research and trade publications in the area covered by the course is required in Course 412 than in Course 212, and different examinations are given for the two courses.

413. KINDS AND VARIETIES OF VEGETABLES

Fall term. Credit three hours. Given in even-numbered years. Prerequisite, Course 103 or 211 or permission to register. Lecture and laboratory, Th F 2-4:30. Laboratory work preceding the beginning of regular instruction is required September 19-20. Report at East Ithaca Gardens at 8:00 a.m., Monday, September 19. If possible, please notify the instructor of intention to take this course early in September. Professor Minges.

Designed to help students achieve proficiency in the evaluation of vegetable varieties through study of their origin, characteristics, adaptation, and usage. An important part of the course is the study of crops in the field. The vegetable seed industry is also discussed.

[429. SPECIAL TOPICS IN PLANT SCIENCE EXTENSION

Spring term. Credit one hour. (Additional credit by special arrangement.) Given in alternate years. Lecture, F 8. Discussion period, F 2-4. East Roberts 223. Professors Minges and A. A. Johnson.] Not given in 1966-1967.

Designed for graduate students and advanced undergraduates in the several plant science fields who wish to acquire a knowledge of extension activities in preparation for careers in extension and associated work, such as research and technical work in both public and commercial organizations. Topics are related to extension in other countries as well as in the United States. Staff members from other plant science departments collaborate in teaching the course.

501. RESEARCH METHODS IN VEGETABLE CROPS

Spring term. Credit three hours. Given in alternate years. Prerequisite, Course 401. It is recommended that Plant Breeding 510 and 511 precede or accompany this course. Lectures, M W F 9. East Roberts 223. Professor Kelly.

A study of research techniques peculiar to vegetable crops.

601. SEMINAR

Fall and spring terms. Required of graduate students taking either a major or minor in this department. Undergraduates are welcome. Th 4:30. East Roberts 222. Members of departmental staff.

COURSES IN OTHER COLLEGES

Satisfactory completion of certain courses in other colleges at Cornell may meet the specific requirements of regular students in the College of Agriculture.

Reference should be made to the *Announcement of the College of Arts and Sciences*, or to the supplements issued by that College, for descriptions of English 111 and 112, Chemistry 103 and 104, or 107 and 108, Physics 101 and 102, Geology 105, and Biological Sciences 103-104, which may be used to satisfy the requirements in those subjects, as listed on pages 32-33.

GENERAL INFORMATION

THE BUILDINGS

The buildings and land of Cornell University are valued at approximately \$100,000,000 and the equipment at approximately \$39,000,000. On that portion of the campus devoted principally to the College of Agriculture, and frequently referred to as the "upper campus," there are fourteen buildings containing classrooms. Around the "Ag quadrangle" are the following buildings which house the departments indicated:

Comstock Hall, entomology	East Roberts Hall, vegetable crops
Caldwell Hall, agronomy	Plant Science Building, floriculture
Warren Hall, agricultural economics and rural sociology	and ornamental horticulture, genetics and development, pomology, plant breeding, and plant pathology
Stone Hall, rural education	
Roberts Hall, division of biological sciences and extension teaching and information	

Slightly northwest of the quadrangle is Savage Hall in which are centered some of the activities in nutrition. In succession to the east of the quadrangle are:

Fernow Hall, conservation	Morrison Hall, animal science
Rice Hall, poultry science	Wing Hall, biochemistry and molecular biology
Stocking Hall, food science and microbiology	
Riley-Robb Hall, agricultural engineering	

As far as possible, classes and laboratory exercises for courses offered in the sixteen departments of the College are conducted in the buildings in which the offices of the departments are located. However, in many instances this is impossible. The student should therefore consult the course descriptions in this Announcement in order to determine the exact location of each class or laboratory exercise.

In addition to the foregoing classroom buildings, on the campus of the College are an auditorium (Bailey Hall), a fine modern library (Mann Library), new bioclimatic laboratories, sixteen greenhouses, a judging pavilion, and numerous special laboratories and barns.

Students in the College of Agriculture take many courses in other colleges of the University, particularly in the College of Arts and Sciences. There the most frequently visited buildings are Goldwin Smith Hall for English and the humanities, Baker Laboratory for chemistry, Rockefeller Hall for physics, Sibley Hall for government and history, Stimson Hall for ecology and systematics, and White Hall for mathematics.

Of interest to all students in the University are such buildings as the Uris Library for undergraduate study; Olin Library for graduate research; Gannett Medical Clinic; Willard Straight Hall for social activities; Anabel Taylor Hall for interfaith activities; Barton Hall,

Helen Newman Hall, and Teagle Hall for physical education; Lynah Hall for ice skating; and Sage Chapel for interdenominational church services.

The offices of administration for the College of Agriculture are located in Roberts Hall, and those for the general administration of the entire University are situated in Day Hall. The administrative center of student life in the College of Agriculture is the Office of Resident Instruction located in Roberts Hall. All students, both prospective and already enrolled, are urged to visit this office for guidance on questions pertaining to undergraduate activities.

LANDS FOR RESEARCH AND INSTRUCTION

Cornell University owns or leases about 12,000 acres of land. Of this, approximately 7,500 acres are used by the several departments of the College of Agriculture. About 600 acres more are in wildlife preserves and field stations and are used jointly by several departments of the University.

The type and amount of land assigned to each department varies according to its needs. Some departments, such as Agronomy, Plant Breeding, Floriculture and Ornamental Horticulture, and Vegetable Crops, need tillable land with certain types of soil on which to conduct field experiments. The Animal Science Department needs large areas suitable for pasture and for the production of hay, grain, and corn for silage to feed experimental animals in the dairy and beef cattle herds, sheep, and swine. The Department of Pomology has an area of about 100 acres that is used for orchard and small fruits, and the Department of Poultry Science uses a sizable area for poultry buildings and range.

Arable land not immediately needed by the individual departments for research and instruction is operated by the Office of Farm Services on an extensive basis. This office also acts as a service department, plowing and fitting some of the land used by other departments for experimental purposes. This system avoids the duplication of expensive machinery and uses the farm labor efficiently. The Departments of Animal Science, Agronomy, Plant Breeding, and Pomology, because they have such large acreage under cultivation, own their own equipment.

The cropland and pasture used by departments of the College comprise about 3,000 acres. The remaining area used by the College consists of forest tracts and of lands used as wildlife preserves and field stations. The Department of Conservation alone operates almost 5,000 acres, of which the Arnot Forest, about twenty miles southwest of Ithaca and consisting of more than 4,000 acres, and the Cornell University Biological Field Station on Oneida Lake of 400 acres are the most extensive. The wildlife preserves and field stations include a biology field station at the head of Cayuga Lake, wildlife reservations at McLean and Ringwood (each only a short distance from Ithaca), and a wildlife

preserve at Slaterville. Vegetable crops and floriculture research is conducted on Long Island and a foundation seed potato farm is located near Lake Placid.

The New York State Agricultural Experiment Station at Geneva occupies 640 acres of land used for fruit and vegetable research. It has 30 acres of experimental grape vineyard and laboratory facilities at Fredonia in Chautauqua County, and it leases laboratory facilities at Highland in the Hudson Valley for research serving the fruit and vegetable industry of that region.

LIBRARIES

The Colleges of Agriculture and Home Economics are served by the Albert R. Mann Library of about 300,000 volumes. This is supplemented by the other libraries of Cornell University, containing about 2,500,000 volumes, many of which also relate directly to agricultural and home economics subjects. In addition to materials on applied agriculture and home economics, the Mann Library contains extensive collections dealing with such related sciences as botany, biochemistry, microbiology, genetics, entomology, and medicine. It also includes large collections in economics, sociology, psychology, and education, and smaller collections on a variety of other subjects. Of major importance are the numerous complete files of foreign and domestic periodicals and government publications, of which some 8,500 are received currently.

The principal collection on entomology and limnology is in Comstock Hall. Small collections of reprints, bulletins, and duplicate books and journals are provided by several departments in their own buildings for use by their faculty and graduate students.

The Albert R. Mann Library building, completed in 1952, has a capacity of 500,000 volumes and 700 reading-room seats. The first floor is devoted primarily to books assigned for class reading, with rooms seating 375 persons. Also on this floor is a room for small groups studying together, the Ellis Room containing books and periodicals for casual reading, and Xerox copy service. On the second floor are the reference, bibliography and periodical reading rooms, a typing room, offices and work rooms, the main loan desk, and the card catalog. The catalog provides a record of the library materials in all libraries and departmental collections of the Colleges. The library has a comprehensive collection of bibliographies, as well as a card catalog of publications of the United States Department of Agriculture.

When the University is in session, the library is open, with librarians on duty to assist readers, from 8 a.m. to 11:30 p.m. daily except Saturday, when it closes at 5 p.m., and Sunday, when it opens at 1 p.m. Students must present identification cards when borrowing books. Information on library regulations and suggestions for use of the library are provided all new students in orientation meetings each fall. More detailed information appears in booklets distributed at that time.

SCHOLARSHIPS

General Information

Scholarships available only to students in the College of Agriculture are listed on the following pages. *Applications for these scholarships should be made on a College of Agriculture Scholarship Application at the Office of Resident Instruction, 192 Roberts Hall*, except that entering students who do not live on farms will be considered if they file the Cornell University Financial Aid Application with the Office of Scholarships and Financial Aid, 105 Day Hall. This form must be supplemented by the parents' confidential financial statement.

Financial aid in the form of scholarships, jobs, and loans is also awarded from other funds on a competitive basis to students entering or enrolled in any undergraduate division of the University. Brochures describing this aid and application blanks are available from the Office of Scholarships and Financial Aid.

Recipients of Scholar Incentive Awards, Regents College Scholarships, Regents Scholarships for Children of Deceased or Disabled Veterans, and Special State Scholarships for Children of Disabled or Deceased Soldiers, Sailors, or Marines, who enroll at the New York State College of Agriculture, may apply the amount of money they receive toward their college expenses.

Scholarships Awarded By the College of Agriculture

ROBERT M. ADAMS 4-H MEMORIAL SCHOLARSHIP. The Robert M. Adams 4-H Memorial Scholarship was established in memory of Professor R. M. Adams by the 4-H Clubs of the state. It yields approximately \$50 a year. Students who are New York State residents are eligible to apply after their first year in the College, and those who have been 4-H Club members are given first consideration. The award is based on financial need, character, ability, and scholarship. Application should be made by June 1.

BEATTY AGRICULTURAL SCHOLARSHIP. The Beatty Agricultural Scholarship fund, a gift of the late Harrison L. Beatty, provides a scholarship of approximately \$300 to a student entering the College of Agriculture from the Town of Bainbridge or from Chenango County. Grades in Regents Examinations receive major consideration in making the award. Application blanks may be obtained from guidance counselors in Chenango County schools and must be on file by January 15.

HENRY H. BUCKLEY STUDENT AID FUND. A fund is provided by the Henry H. Buckley Foundation in memory of Mr. Buckley, a well-known farmer of Oneonta, New York, who died in 1942. The purpose is to aid worthy students, of any class, who need financial as-

sistance. In making awards, preference will be given to applicants from Chenango, Delaware, Herkimer, Madison, Montgomery, Oneida, Otsego, and Schoharie counties.

The last date for filing applications by prospective students is January 15, and for students in residence it is June 1.

WALTER R. CLARKE MEMORIAL ENDOWMENT. The Walter R. Clarke Memorial Endowment in memory of Mr. Clarke, a prominent fruit farmer who lived at Milton, New York, provides a scholarship of \$150 each year for a student of any class in the College of Agriculture who is primarily interested in fruit growing. Promise of successful work in this field is the basis for an award. Preference is given to students from the Hudson Valley area. The last date for filing applications by prospective students is January 15, and for students in residence it is June 1.

CORNELL-ARGENTINE EXCHANGE SCHOLARSHIP. A male freshman is chosen each May to spend a year at the University of Buenos Aires. Most expenses, other than transportation, are paid by the sponsors in Argentina. In exchange, a student enrolled with the Faculty of Agronomy and Veterinary of the University of Buenos Aires is chosen to come to Cornell to study for one year in the College of Agriculture. His expenses here are paid by the Office of Foreign Students, the College, and students.

Information is available at the Office of Resident Instruction. To be eligible, a freshman must have an average of C+ or above and must file an application by the end of the first week in April. The selection is made by a student-faculty committee.

CORNELL DAIRY SCIENCE ASSOCIATION SCHOLARSHIP. A scholarship of \$400 is provided by the Cornell Dairy Science Association. It is awarded at the end of the sophomore year to a student with a major in dairy industry. A payment of \$100 is made at the beginning of each term of the junior and senior years provided the recipient continues with a major in dairy industry. Applications should be filed by June 1.

CORNELL POMOLOGY CLUB SCHOLARSHIP OR GRANT-IN-AID. The Pomology Club provides a scholarship or grant-in-aid of \$400 each year, to be awarded to a sophomore, or a senior student who is specializing in pomology or has major interest in that field. Scholarship and financial need receive equal consideration in making awards, and qualified students are eligible for awards in succeeding years. Applications should be filed by June 1.

CORNELL-SWEDISH EXCHANGE SCHOLARSHIP. A male sophomore is chosen each year to spend his third college year at the Agricultural College of Sweden, Ultuna, Sweden. All expenses except transportation are paid by the Swedish students. In exchange a student from the Agricultural College of Sweden is chosen to come to Cornell, and the students of the College of Agriculture pay his expenses.

Information and application blanks are available at the Office of

Resident Instruction. To be eligible, a sophomore must have an average of C+ or above, and he must file an application by the end of the first week in January. The selection is made by a student-faculty committee early in February.

WILLIAM FREDERICK DREER FUND. A fund from the estate of William Frederick Dreer has been established to provide a worthy student specializing in floriculture or ornamental horticulture an opportunity for study and directed practice in foreign countries for approximately one year. The award is currently \$2,500 and is available to either an undergraduate or graduate student within the period of his college course or upon its conclusion. Scholarship, character, maturity, seriousness of purpose, and promise of ability to make contributions to his field are considered in making awards. Applications should be on file at the Office of the Department of Floriculture and Ornamental Horticulture by December 1 preceding the June in which travel will start.

LEONARD A. DUDLEY SCHOLARSHIP ENDOWMENT. The Leonard A. Dudley Scholarship Endowment was established by gifts from Leonard A. Dudley of Binghamton, New York. The income from the fund provides scholarships for members of any class in the College of Agriculture. Awards are made to deserving men or women with demonstrated financial need who are specializing in agricultural engineering, agricultural business, or agricultural science.

In selecting recipients, the Scholarship Committee gives first preference to students from Broome County and second preference to students from Tioga, Cortland, Chenango, and Delaware Counties. The last date for filing applications by prospective students is January 15, and for students in residence it is June 1.

EASTERN FROSTED FOODS ASSOCIATION SCHOLARSHIP. An annual scholarship of \$500 has been established by the Eastern Frosted Foods Association. It is to be awarded, at the end of the sophomore or junior year, to a student in food technology. In considering candidates, the Committee on Scholarships gives major emphasis to indications of ability to promote advancement of the industry, with preference to those with special interest in freezing. Applications must be filed by June 1.

EASTERN MILK PRODUCERS COOPERATIVE SCHOLARSHIPS. Three annual scholarships of \$500 each are provided by the Eastern Milk Producers Cooperative Association, Inc. Their purpose is to assist worthy students of any class in the College of Agriculture, with preference to be given to sons or daughters of members of Eastern Milk Producers Cooperative Association. In order to qualify, students must rank in the upper two-fifths of their high school graduating class or of their class in college. They must also establish a need for financial assistance and show evidence of outstanding character and leadership ability. Applications from entering freshmen must be received by January 15 and from others by June 1.

FEDERATED GARDEN CLUBS OF NEW YORK STATE SCHOLARSHIPS. Two annual scholarships of \$250 are provided by the Federated Garden Clubs of New York State, Inc. They may be awarded to worthy four-year students in any class who are residents of New York State, who intend to specialize in floriculture and ornamental horticulture, and who are of good moral character. Both need and scholastic promise are considered in selecting the recipients. The last date for filing applications by prospective students is January 15, and for students in residence it is June 1.

R. T. FRENCH FOOD TECHNOLOGY SCHOLARSHIPS. In order to encourage outstanding undergraduate students with limited financial means, the R. T. French Company has provided two annual awards of \$1000 to assist students in any class in the College of Agriculture. The selection of the recipients will be based on character, scholastic record, and financial need, with preference being given to students who indicate that they are likely to do graduate work in food science. The last date for filing applications by prospective students is January 15, and for students in residence it is June 1.

GENERAL FOODS FUND SCHOLARSHIPS. The General Foods Fund, Inc., has provided ten scholarships for freshmen and five scholarships for sophomores. The freshman scholarships are valued at \$400 and the sophomore scholarships at \$200. Students specializing in agricultural engineering, bacteriology, biochemistry, biological science, and in dairy and food science are eligible to apply. The awards are made on the basis of intellectual competency, demonstrated leadership ability, high moral character, and financial need. Freshman applications must be filed by January 15, sophomore applications by June 1.

GERBER SCHOLARSHIP IN HORTICULTURE. The Gerber Baby Foods Fund, Fremont, Michigan has established an annual scholarship of \$500. The scholarship will be awarded to a resident of New York State who will be enrolled as an upperclassman in the College of Agriculture. The selection will be based on character, promise for leadership in horticulture and with equal consideration given to scholarship and financial need. In making the selection, preference will be given to students specializing in agronomy, entomology, plant pathology, pomology, and vegetable crops. Applications must be filed by June 1 and should substantiate the applicants' interest in horticulture.

HEATLEY GREEN SCHOLARSHIP. The Heatley Green Scholarship Endowment was established under the will of Mrs. Green in memory of her husband, who had been a New York State farm boy and was a graduate of the College of Engineering at Cornell in the class of 1901. Mr. Green believed strongly in proper training for successful farming, and this scholarship is used to help and encourage worthy undergraduate students of moderate means. Awards are on an annual basis and may be made to one student or divided between two or more students of any class in the College of Agriculture. The last date for filing applications by prospective students is January 15, and for students in residence it is June 1.

HERVEY S. HALL SCHOLARSHIP. The Hervey S. Hall Scholarship, established by bequest of Miss Mary F. Hall of Spencer, New York, and having an annual value of \$150, is awarded to a properly qualified student of either sex, a resident of New York State pursuing a course in agriculture leading to the degree of Bachelor of Science, and in need of financial aid. It is "to be granted first to a student from the town of Spencer, New York, should a suitable candidate appear, or a student from Tioga County, or from the State at large." Application should be made by June 1.

H. J. HEINZ COMPANY SCHOLARSHIP. The H. J. Heinz Company has provided a scholarship for students participating in the Food Distribution Program. The value of this scholarship is \$1,500. The student will receive \$1,000. The remaining \$500 will be used to expand the Food Distribution Program. The award is made on the basis of scholastic achievement or promise, character, financial need, and the student's desire to pursue a career in the food industry. This scholarship is not available to students on leave of absence from food companies. Application must be completed by June 1.

ALFRED C. HOTTES AMATEUR GARDENING SCHOLARSHIP. The Alfred C. Hottes Amateur Gardening Scholarship Fund, a gift of the late Alfred C. Hottes, provides one or two scholarships of \$300. Eligible candidates are undergraduate students in the College of Agriculture who, by reason of their academic records, character, and activities, show promise of advancing through their study and work the subject of floriculture and ornamental horticulture as an amateur activity. In the application each applicant should point out how he might be expected to do this. Application should be made by June 1.

BURTON A. JENNINGS MEMORIAL ENDOWMENT FUND. The Burton A. Jennings Memorial Endowment Fund was established in memory of Professor Emeritus Burton A. Jennings, a faculty member of the Agricultural Engineering Department from 1922 until his retirement in 1958. Income from the fund is to provide a scholarship or grant-in-aid for a deserving student. First preference is given to a student specializing in agricultural engineering who has completed the sophomore year. Applications must be received by June 1.

JEWEL T FOUNDATION SCHOLARSHIPS. The Jewel T Foundation has established two \$500 scholarships. One scholarship will be awarded to a senior specializing in food distribution who has a career objective in the food industry. The second scholarship will be awarded at the end of the senior year to a student specializing in food distribution with a career objective in the food industry, and who is pursuing the combined course in the Graduate School of Business and Public Administration. Applications must be filed by June 1.

DAVID KENNEDY JOHNSTON ENDOWMENT FUND. This fund, established by a bequest under the will of Nettie J. Huey, provides scholarships and grants-in-aid for worthy students entering the College, or already enrolled, and specializing in animal science. Preference

is given to residents of Venango County, Pennsylvania. The last day for prospective students to apply is January 15, and for students in residence it is June 1.

CARL E. LADD MEMORIAL SCHOLARSHIPS. A fund in memory of Carl E. Ladd, Dean of the College from 1932 until his death in 1943, provides a number of scholarships which are open to young men and women from New York farms who are members of any class in the College of Agriculture. The awards are made on the basis of character, financial need, promise for future leadership, and school record. Applications from prospective students should be made by January 15. Students in residence should file applications by June 1.

GEORGE LA MONT EDUCATIONAL FUND. The George LaMont Educational Fund was established by gifts from George B. LaMont and his son T. E. LaMont, owners of the LaMont Fruit Farm in Albion, Orleans County, New York. The income from the fund provides one or two scholarships, of \$300 each, for Orleans County farm boys of good moral character, who have a record in school and out that shows ability and application, and who are in need of financial assistance. Awards are for one year and usually are made only to young men entering college. Application blanks are distributed by the guidance counselors and teachers of vocational agriculture in Orleans County high schools. Applications must be received by January 15.

HUDSON H. LYON MEMORIAL SCHOLARSHIP. The endowment for this scholarship fund was established by the late H. H. Lyon of Bainbridge, New York. The income, amounting to about \$1,600 a year, is to be used to aid students who are preparing for Protestant Christian missionary service, with preference to those who include agriculture in their training. The last date for filing applications by prospective students is January 15, and for students in residence it is June 1.

ROBERT N. MARSHALL MEMORIAL POULTRY SCHOLARSHIP. This fund, given by friends of Robert N. Marshall, a prominent poultryman, provides an annual scholarship or grant-in-aid to help a deserving student. In making the selection, first preference is given to an entering freshman who intends to specialize in poultry science. Otherwise, it is to go to an upperclassman in the Department of Poultry Science. The last date for filing applications by prospective students is January 15, and for students in residence it is June 1.

FRANK W. MASON AGRICULTURAL SCHOLARSHIP. The Frank W. Mason Agricultural Scholarship was established by gifts from Frank W. Mason, a prominent fruit farmer of Albion, Orleans County, New York. The income provides an annual scholarship of \$200 for a young man or woman from Orleans County, with preference given to graduates of the Albion Central School and those who are interested in fruit growing or marketing. In making awards, consideration is given to need for financial assistance, academic ability, moral character, and promise for future leadership in the broad relationships of agriculture.

Application blanks are distributed by the guidance counselors and

teachers of vocational agriculture in Orleans County high schools. Applications must be received by January 15.

W. S. MIDDAUGH-ALPHA ZETA MEMORIAL SCHOLARSHIP. In order to recognize those students dedicated to making a real contribution to agricultural business or international agriculture, the W. S. Middaugh-Alpha Zeta Memorial Scholarship is granted in memory of Wessels S. Middaugh, '26, who dedicated his life to service through a career in international agriculture.

The award is made to a student who ranks in the upper two-fifths of his class, is of good character, and who has demonstrated leadership ability. Financial need is not considered. Preference is given to members of Alpha Zeta, the national professional agricultural honorary fraternity. Ordinarily, the award is made at the end of the junior year. Application should be made by June 1.

FRANK B. MORRISON MEMORIAL SCHOLARSHIPS. An endowment fund, established by Mrs. Frank B. Morrison in memory of her husband, a former head of the Department of Animal Science, provides two annual awards of \$300 each. They are made to juniors or seniors of outstanding ability whose major interests are in animal science. A committee from the faculty of the Department of Animal Science considers both academic achievement and personal qualities of leadership and character in recommending awards. Applications should be filed by June 1.

NATIONAL FOOD BROKERS ASSOCIATION FOUNDATION, INCORPORATED, SCHOLARSHIP. The National Food Brokers Association Foundation, Inc., has provided a scholarship for students participating in the Food Distribution Program. The value of this scholarship is \$400. The award is made on the basis of scholastic achievement or promise, character, financial need, and the student's desire to pursue a career in the food industry. Application must be completed by June 1.

NEW YORK FARMERS SCHOLARSHIPS. This fund is provided by the New York Farmers for the purpose of assisting young men with good ability, who need financial aid, to continue their agricultural education. Preference in making awards will be given to farm boys, those who wish to farm, and those who expect to serve farmers directly. Applications for the freshman scholarships must be received by January 15 and for sophomore, junior, and senior year scholarships by June 1.

NEW YORK LIME ASSOCIATION SCHOLARSHIPS. The New York Lime Association provides two annual scholarships of \$250 each, to be awarded to members of the three upper classes. In selecting students for awards major interest in agronomy, scholastic achievement especially in the sciences, potential ability for leadership, and need for financial assistance are considered, with preference being given to residents of New York State. The awards are normally given for one year but may be renewed if the student qualifies in competition with other members of his class. Applications must be filed by June 1.

RALSTON PURINA AIDS TO EDUCATION. The Ralston Purina Company has provided the following three scholarships: *Ralston Purina Scholarship*: The Company offers an annual scholarship of \$500 to an outstanding undergraduate student in agriculture. The award is made each year to a student who will be entering his senior year or, under unusual circumstances, his junior year. The recipient must rank in the upper 25 per cent of his class scholastically. Evidence of leadership ability, moral character, participation in extracurricular affairs, sincerity of purpose, and financial need are taken into account in making an award. Applications must be filed by June 1. *Danforth Leadership Training Scholarship for Agricultural Freshmen*: An outstanding freshman is selected to represent the College at Camp Miniwanca, Stony Lake, Michigan. He joins freshmen from U. S. Land-Grant Colleges and from three Canadian agricultural colleges for two weeks of leadership training in August. Full tuition is paid by the Ralston Purina Company. The selection is made in May from those freshmen with outstanding records in the fall semester. *Danforth Award for Agricultural College Seniors*: An outstanding junior is selected to join representatives from other U. S. Land-Grant Colleges and from three Canadian agricultural colleges for two weeks of study in St. Louis and two weeks of leadership training at Camp Miniwanca, Stony Lake, Michigan, during August before starting the senior year. The Ralston Purina Company pays the expenses for the four weeks, including a travel allowance. The selection is made in April and May each year from among high ranking juniors.

ROBERTS SCHOLARSHIPS. The Roberts Scholarship Fund, a gift of the late Dr. Charles H. Roberts, of Oakes, Ulster County, New York, provides five scholarships, each retainable for one year, but not open to entering students. As expressed by the founder, the purpose of these scholarships is to furnish financial assistance to students in the College of Agriculture who are of good moral character, who show native ability, tact, and application, and who are in need of such assistance, especially students coming from rural districts. The awards are made after the close of each year. Applications must be filed by June 1. The present value of each scholarship is \$300.

AARON H. RUBENFELD MEMORIAL SCHOLARSHIP. The Aaron H. Rubenfeld Memorial Scholarship was established by the Middletown Milk & Cream and Dellwood Dairy Divisions of Deltown Foods, Inc., of Yonkers, New York, in memory of their late president and founder, who believed in actively encouraging progress in the dairy industry. Candidates for this \$500 award must have completed their sophomore year in the College, must show evidence of need for the financial assistance, must have demonstrated interest in the dairy industry, and must possess characteristics that indicate potential ability to contribute to improvement in the production, marketing, and manufacture of milk and milk products. With other qualifications equal, preference will be given to children of employees of either of these two companies and of producers shipping their milk to Middletown Milk & Cream Division or

its affiliates. Payment of \$125 is made to the recipient at the beginning of each semester in the junior and senior year. Applications should be filed not later than June 1.

SEARS, ROEBUCK SCHOLARSHIPS. The Sears, Roebuck Foundation has provided scholarships for freshmen who have demonstrated an interest in agriculture. The value of each scholarship is \$300 or \$400. The awards are made on the basis of character, financial need, scholastic promise, and potential for leadership in the field of agriculture. Applications must be completed by January 15.

LELAND SPENCER DAIRY MARKETING RESEARCH FUND SCHOLARSHIP. The Dairy Marketing Research Fund has established this scholarship in recognition of Professor Emeritus Leland Spencer and his contributions in the dairy marketing field. The scholarship is available to an undergraduate student in the New York State College of Agriculture who has demonstrated his potential for making a contribution in the field of dairy marketing. In selecting recipients, the Scholarship Committee will give special consideration to those who have: Completed the work of the junior year; achieved a rank in the upper third of their class; taken courses in dairy marketing, dairy industry, dairy husbandry, and farm management or who have otherwise demonstrated a special interest in the area of dairy marketing. Application must be filed with all supporting information by June 1.

WARD W. STEVENS HOLSTEIN SCHOLARSHIP. A fund in honor of Ward W. Stevens provides a scholarship to a male undergraduate student in the College of Agriculture, who has completed at least one-half of his course. The value of the scholarship is \$750. It may be awarded to one student or divided between two students. A student who has held the scholarship is eligible to reapply. The award is based on character, exceptional ability in the judging and handling of dairy cattle, high scholastic rank in dairy-husbandry courses, need of financial assistance, and special interest in the Holstein breed of cattle. Applications should be received by June 1.

MAY WALKER AGRICULTURAL SCHOLARSHIP FUND. The May Walker Agricultural Scholarship Fund was established under the will of May Walker in gratitude for the assistance given her by the University in 1919 and 1920. An annual award will be made by the Scholarship Committee for the benefit of a student from the United Kingdom or the British Commonwealth who is attending the College of Agriculture. Applications from entering students should be received by January 15 and from students in residence by June 1. The applicant must clarify his place of residence on the application form.

LOUIS WARE SCHOLARSHIP-FELLOWSHIP AWARD. An annual scholarship of \$1,000 has been provided by the International Minerals and Chemical Corporation as a tribute to the chairman of its board, Louis Ware, and his lifetime interest in agriculture and mining. The purpose of this award is to recognize and encourage a student entering the senior year, who is academically and personally outstanding and who

is likely to continue his achievements in the field of agricultural science in Graduate School. Need is not a primary consideration. The recipients of these senior scholarships in seven colleges of agriculture will be eligible to compete for a graduate fellowship in agricultural science. This graduate fellowship will be renewable so that a recipient, if he is meeting the requirements, will receive \$3,000 for each of three years, if necessary for completion of his Ph.D. study and research. Applications must be filed by June 1 and should include the major field in which graduate work is likely to be pursued.

WESTERN NEW YORK SECTION OF THE INSTITUTE OF FOOD TECHNOLOGISTS AWARD. Two annual scholarships of \$300 are provided by the Western New York Section of the Institute of Food Technologists. They are available to worthy students who have been approved for admission or who are enrolled in the College with a specialization in the Department of Food Science. The last date for prospective students to apply is January 15, and for students in residence it is June 1.

WOMAN'S NATIONAL FARM AND GARDEN ASSOCIATION SCHOLARSHIPS. The New York State division of this Association has provided the following two scholarships: *A Scholarship in Honor of its First President, Mrs. Francis King*: The value of the scholarship is \$250. The award is made biennially to a woman of the sophomore class in the College of Agriculture, who is then given preference for the award in her junior year. Character, interest in agriculture, scholarship, and financial need are considered. Applications should be made before June 1. *A Scholarship in Memory of its Former Honorary President, Mrs. Walter Douglas*: Junior or senior women in the College of Agriculture who have achieved high standing are eligible to apply for the award of \$200. Character and financial need are considered, with preference given to girls who have been active in a 4-H Club. Application should be made by June 1.

SCHOLARSHIPS FOR NONRESIDENTS. Twenty tuition scholarships are available for nonresidents of the State. They are awarded annually, and evidence of need is required. The last date for filing by prospective students is January 15, and for students in residence it is June 1.

Other Scholarships

Information about other scholarships open under certain conditions to undergraduates in the College of Agriculture may be obtained in the Office of Scholarships and Financial Aid, Day Hall.

AWARDS

ALPHA ZETA SCHOLARSHIP KEY. The Alpha Zeta Fraternity presents a scholarship key to the student who made the highest scholastic

average in the first year of the four-year course. The name of the recipient is also inscribed on a plaque in the Office of Resident Instruction. The key is presented at the annual barbecue in the fall.

ALUMNI PRIZES. The Alumni Association of the College of Agriculture provides two annual prizes of \$50. These are awarded by the faculty, one to the junior who had the highest cumulative average at the end of the sophomore year, and one to the senior who had the highest cumulative average at the end of the junior year.

BORDEN AGRICULTURAL SCHOLARSHIP AWARD. The Borden Company has established an annual scholarship award to recognize and assist outstanding students who give promise of future achievement. The award is made to the student in the College of Agriculture who, upon entering his senior year, has the highest average grade for all of his previous college work of any of the similarly eligible students. (Students in food distribution are not eligible.) The value is \$300 payable upon registration in the College for the senior year.

BORDEN SCHOLARSHIP AWARD IN FOOD DISTRIBUTION. The Borden Company Foundation has established an annual scholarship award of \$300. All full-time senior students specializing in food distribution shall be eligible. The award shall be presented to that eligible student who has achieved the highest cumulative quality point average for all college work preceding his senior year.

BURPEE AWARD IN HORTICULTURE. An annual award of \$100 is made possible through a grant from the W. Atlee Burpee Company, Seed Growers, Philadelphia, Pennsylvania, and Clinton, Iowa. The purpose is to encourage outstanding students in the study of vegetable growing and flower growing. The award is made at the beginning of the senior year and is divided equally between two students, one in the field of floriculture and ornamental horticulture and the other in vegetable crop production. To be eligible, the student shall have completed Biological Sciences 240 or its equivalent, and at least two courses in the department concerned, and shall have signified intention of specializing in that department.

EASTMAN PRIZES FOR PUBLIC SPEAKING. The Eastman Prizes for Public Speaking of \$100 and \$25, established in 1918, are awarded by a committee of judges to any regular or special student in the College of Agriculture for public speaking on country-life subjects. Elimination contests are held beginning approximately December 1, with the final contest taking place during the spring semester. Contestants sign up before December 1 in the Extension Teaching and Information Office, 510 Mann Hall, where additional information may be obtained.

PAUL H. GULDIN MEMORIAL ENDOWMENT. The Paul H. Guldin Memorial Endowment, established by Mrs. Paul H. Guldin as a memorial to her husband, a graduate of the College in 1912, is to encourage undergraduate students in the Colleges of Agriculture and Home Economics to become interested, and to take part, in the development of a more adequate rural leadership. The income supports a contest for the best original articles or stories, written by undergradu-

ates in these Colleges and published in the *Cornell Countryman*, that contribute to the purpose of the endowment. The awards will be made twice a year, the first award being based on the articles in the October, November, December, and January issues and the second awards on the February, March, April, and May issues. In each instance the awards will be \$75 for first place, \$50 for second place, and \$25 for third place. The selection will be made by a committee from the faculty, appointed by the Dean.

FRANK B. MORRISON MEMORIAL PRIZES. The Frank B. Morrison Memorial Prizes, totaling \$100 annually, are given to students winning top awards in the Students' Fitting and Showmanship Contest.

NATIONAL PLANT FOOD INSTITUTE SOIL FERTILITY ACHIEVEMENT AWARD. The National Plant Food Institute has provided an award of \$200 for an outstanding junior or senior who has enrolled in at least four courses in agronomy and/or courses dealing primarily with plant nutrition. Selection of the student will be made on the basis of scholarship, leadership, character, and professional interest in the field of soil fertility. The recipient will receive an appropriate key and his name will be engraved on a plaque.

CHARLES LATHROP PACK FOUNDATION FORESTRY PRIZE. The Charles Lathrop Pack Foundation Forestry Prize of \$40 is awarded annually in April for the best essay on forestry submitted by a resident student who has taken some course in forestry during the current college year. The purpose of the prize is to aid in training men and women to write articles that will arouse in the public an interest in forestry and an appreciation of what forestry means to the country. The award is made by a committee appointed by the President of the University. The detailed regulations are furnished by the Department of Conservation. The essay must be deposited at the office of the head of the Department of Conservation by noon on April 15.

RICE DEBATE STAGE. The Rice Debate Prizes of \$100 and \$25, established in 1927, are awarded by a committee of judges to any regular or special student in the College of Agriculture for a public debate on farm life problems. A topic is selected each year by a faculty committee. Elimination contests are held beginning approximately December 1, with the final contest taking place during the spring semester. Contestants sign up before December 1 in the Extension Teaching and Information Office, 510 Mann Hall, where additional information concerning the topic and the contest may be obtained.

RING MEMORIAL FUND PRIZE. The Ring Memorial Fund was established under the will of Charles A. Ring to advance horticultural science. The income is used for a prize of approximately \$50 to be awarded to an outstanding sophomore student specializing in plant or horticultural science.

Instructors and advisers of students in the plant sciences are requested to nominate, in writing, sophomores who show promise of advancing horticultural science. Consideration is to be given to grades in horticultural and supporting science courses; attitude toward educa-

tion, horticulture, and scientific work; demonstrated ability for leadership; character and personality. Nominations must be received at the Office of Resident Instruction before May 1.

SAMUEL L. STEWART PRIZE. The Samuel L. Stewart Prize of \$100 is offered annually in an essay contest, to promote the production and distribution of high-quality milk, and to acquaint producers and handlers with the factors which may affect its palatability. The contest is open to undergraduate students in the College of Agriculture. Essays of 600 to 800 words must be filed at the Office of Resident Instruction by April 15.

OTHER PRIZES. Information concerning other prizes open to students enrolled in the University is given in the *Announcement of Prize Competitions*. Copies may be obtained at the Visitor Information Center, Day Hall.

LOANS

A fund contributed by students of the College is available for small, short-time, emergency loans. Applications may be made to the College Secretary.

A fund, the interest on which is available for loans to students specializing in floriculture, has been established by Mr. Max Schling of New York City. Another loan fund for students of floriculture, with principal and interest available, has been contributed by the New York Florists Club. Applications for loans from both these funds may be made to the College Secretary.

For other loan funds, available to students of all colleges at Cornell, application should be made at the Office of Scholarships and Financial Aid, Day Hall.

HEALTH SERVICES AND MEDICAL CARE

Health services and medical care for students are centered in two Cornell facilities: the Gannett Medical Clinic (out-patient department) and the Sage Hospital. Students are entitled to unlimited visits at the Clinic (appointments with individual doctors at the Clinic may be made, if desired, by calling or coming in person; an acutely ill student will be seen promptly whether he has an appointment or not). Students are also entitled to laboratory and X-ray examinations indicated for diagnosis and treatment, hospitalization in the Sage Hospital with medical care for a maximum of fourteen days each term, and emergency surgical care. The cost of these services is covered in the General Fee.

On a voluntary basis, insurance is available to supplement the services provided by the General Fee. For further details, including charges for special services, see the *Announcement of General Information*. If, in the opinion of the University authorities, the student's health makes it unwise for him to remain in the University, he may be required to withdraw.

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